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NATURAL RELIGION.

X.

THE instinct on which we pride ourselves in political contests seems to desert us in religious. In politics we firmly grasp the principle that the issue must always be practical, never merely logical or speculative. We steadfastly put aside the question, Is this or that true? and as steadfastly keep before our eyes the question, Ought this or that to be done? It is curious to see that in the great religious debate of the day the opposite course is followed, and that it is supposed to be a proof of a masculine way of thinking to put aside the question what ought to be done until the public has made up its mind what is true.

We find ourselves surrounded in religion, as in polity, with a vast and ancient system of institutions. Each system has its practical object. If by the political system we defend ourselves against our enemies, and preserve order and shelter industry, so by the religious we have been in the habit of cherishing by co-operation the higher life among us, of worshipping together, of receiving instruction together in the highest matters. Now as to the political system, we have been perfectly well aware that it was a makeshift, that other systems elsewhere might be intrinsically better—nay, we have had no objection to admit that the theory upon which our political constitution was for long periods supposed to rest,

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might be radically false. And yet we have always steadily refused to entertain the question of pulling this system down and building up another in its place. For a long time we absolutely refused to reform it, for fear of shaking its foundation; and now that we have overcome this timidity, we find that a process of gradual reform may save us the risk and anxiety that would attend all schemes of destructive criticism and fundamental reconstruction.

It would have been possible to proceed in another way. We might have given to dogma the same importance in politics that it has had in religion. Suppose we had formulated in the sixteenth century the principles or beliefs which we supposed to lie at the basis of our national constitution. Suppose we had made a political creed. A very strange creed it would have been! The doctrine of divine right and the power of kings to cure disease, possibly too the whole legend of Brute and the derivation of our state from Troy would have appeared in it. This creed once formulated would have come to be regarded as the dogmatic basis upon which our constitution rested. Then in time criticism would have begun its work. Philosophy would have set aside divine right, science would have exploded the belief about the king's evil, historical criticism would have shaken the traditionary history, and each innovation would have been regarded as a blow dealt at the constitu-

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tion of the country. At last it would have come to be generally thought that the constitution was undermined, that it had been found unable to bear the light of modern science. Men would begin publicly to renounce the constitution; officials would begin to win great applause by resigning their posts from conscientious doubts about the personality of King Arthur; and those who continued orthodox would declare that they felt more respect for such persons, much as they deplored their heresies, than they could feel for other officials who continued to receive the emoluments of the State when it was suspected that they had altogether ceased to believe in the cure of the king's evil, and when they explained away with the most shameless laxity the divine right of the sovereign. If any of this latter school, whom we may call the Broad State, should argue that the State was a practical institution, not a sect of people united by holding the same opinions, that it existed to save the country from invasion and houses from burglary, they would be regarded as impudent sophists. Was not the creed there? Were not all officials required to subscribe it? How then could it be affirmed that the State did not stand upon community of opinion, upon dogma? And if any of these sophists were evidently not impudent, but well meaning and high-minded, they would be regarded as wanting in masculine firmness and the courage to face disagreeable truths. It would be generally agreed that the honest and manly course was to press the controversy firmly to a conclusion, to resist all attempts to confuse the issue, and to keep the public steadily to the fundamental points. Has the sovereign, or has he not, a divine right? Can he, or can he not, cure disease by his touch? Was the country, or was it not, colonised by fugitives from Troy? And if at last the public should come by general consent to decide these questions in the negative, then it would be felt that no weak sentiment ought to be listened

to, no idle gratitude to the constitution for having, perhaps, in past times saved the country from Spanish or French invasion; that all such considerations ought sternly to be put aside as irrelevant; that as honest men we were bound to consider, not whether the constitution was useful or interesting, or the like, but whether it was *true*, and if we could not any longer say with our hands on our hearts that it was so, then, in the name of eternal truth, to renounce it and bid it farewell!

In spite of its logical appearance, we should all feel that this course was not only practically absurd, but actually illogical. It does not follow because a creed has been put forward as the basis of an institution and this creed has been disproved that the institution has been deprived of its foundation. There is another alternative. An ungrounded claim may have been made for the creed, and the institution may really stand upon quite a different foundation. When we are told now-a-days, See how the tide of scepticism has risen round the creeds of the Church, until the very first article of all is just disappearing beneath the waves! what can possibly remain of the Church, or of Christianity, in this spiritual deluge? It is obvious to answer, Christianity at any rate is older than the creeds; is it not possible that a mistake was made when it was supposed that those creeds contained the very essence of Christianity? Surely this is a thing not even unlikely; for history shows that great societies or institutions, rising out of profound needs dimly felt, commonly give a more or less unsatisfactory account of their own origin. It was never supposed that imperial Rome was destroyed when doubt was thrown on the story of the Asylum or Papal Rome, when it was questioned whether St. Peter was ever in Italy.

But what we feel most when we are considering political questions is the practical absurdity of this scholastic, dogmatic way of proceeding. To ask a

large public to constitute itself into a jury to decide philosophical or critical questions is to put it into a false position. *Ignoramus* is the only verdict which, if it is modest, it will venture in such a case to return. Their views on such matters people must take with what caution they can from those who know better, and they may be sure that they will modify them in the taking, so that the most carefully stated philosophical propositions will acquire something of a mythological character in passing into popular creeds. We are aware in politics that we are only safe in discussing what ought to be done, and that we must carefully avoid raising the question, What is philosophically true? And so, though we are well aware that the State must have a philosophical basis, that there must be some theoretical ground both for authority and liberty, yet we carefully put all these questions aside, and feel that the State is real and indestructible only so long as we see that it defends us, that it gives us prosperity and well-being.

It is not equally easy to maintain this position with respect to our religious constitution. The wants which the State supplies are so urgent and palpable, that in comparison with them all mere political doctrines seem secondary; but the wants of the higher life, on the contrary, are by most of us but dimly felt, and seem shadowy, or, as we call it, sentimental, in comparison with theological dogma. Hence the same public which despises doctrinairism in politics is just as decided and united in despising everything but doctrinairism in religion. It is, in fact, so decided on this point, that it will scarcely listen to argument about it, and seems incapable even of a passing suspicion that it may be wrong. With the same contemptuous laugh with which in politics it puts aside abstract theories for practical needs, it refuses in religion to listen to practical views, and thinks it masculine to

look only at articles of technical theology attacked and defended by controversial specialists.

Yet a time will naturally come when men's eyes will be opened to their enormous mistake. Perhaps, indeed, this time is now coming, for it is necessarily brought nearer by every apparent victory of the attacking party in the controversy. So long as the reigning theology maintains itself successfully, no practical question comes in view; but no sooner does it appear shaken than the question occurs, What is to be done? and the assailants themselves, embarrassed by their own success, are compelled, if only for decency's sake, to offer some equivalent for what they destroy. In such moments it flashes upon us all that religion belongs just as little as politics to the schools, and that the concern of practical men in the one department as much as in the other is not with scholastic controversies but with urgent practical needs, and that they deal not with a *tabu'a rasa* on which a new spiritual house might be built up from the foundation on a new design, but with an ancient house in which we have all lived for centuries, and which it would be exceedingly troublesome and uncomfortable, if not impious, to pull to the ground.

The doctrinaire method might indeed be justified by necessity if certain assumptions which are popularly made were true. If the clergy were right in supposing that they were commissioned to defend an immovable fortress of dogma, that in the original scheme of their religion no allowance was made for such a thing as progress, then indeed it would be impossible for them to regard the spiritual wants of man in the same plain practical way in which the politician studies those more material wants which are supplied by the State. On this question, however, we need say nothing more; we have dwelt long enough already on that which is too evident to be mistaken, that in the original scheme of Christi-

anity nothing is so grand and admirable as the treatment of progress, no point so capital as the further development which is reserved for the system, and the indefinite vista which is opened in the future of new dispensations not less divine than the old. It is too evident to be mistaken, that so far from the clerical school being fettered by the terms of their original charter so that they are not allowed to be progressive though they would, it is the narrowness of their own prejudices, the exclusiveness of their own professional pedantry, which reads itself into the Bible, and petrifies and fossilises what is there full of vitality. But there is a misconception on the opposite side which hinders the attacking party from taking practical views, just as this hinders the clerical party of defence. They think that, though in the State it is quite possible to leave speculative questions in abeyance and proceed at once with practical reforms, this is only because those speculative questions do not affect the essence of the State, about which there is really no difference of opinion; but that it is not possible in the Church, where the question in dispute concerns those fundamental beliefs without which there cannot be a Church, actually the very existence of God and of a future life. However we might decide our disputes in political philosophy, they think it would be still necessary to have law-courts and policemen, still essential to pay soldiers to keep off the enemy, and still highly convenient to have a post-office to carry our letters; but if on the contrary the religious debate should go against the Church, we should be obliged at last to pull down our pulpits and sell off our communion-tables, inscribe "eternal sleep" upon our cemeteries, suppress the clerical profession, add the Sunday to the working-days, turn our churches into halls for local business and our cathedrals into county markets or concert-halls, and explain to boys at school and youths at the university that, owing to an unfortunate over-

sight, the human race had taken a wrong path for about eighteen centuries, during which time it had been practically under a sort of mental derangement, and that now it was necessary to forget as soon as possible that idle dream, cancel the whole library of ecclesiastical history and ecclesiastical literature, and begin again at the point where Greek philosophy and classical literature stood when the oriental inundation submerged them. This fancy too begins to seem a misconception the more the moment draws near for realizing it. There is really no more question of destroying religion than of destroying the State. The wildest innovators in their wildest fit have recognised this. They always set up some goddess of Reason, some image of Nature if not some supreme Being, in place of the objects of worship which they renounced; and since that time how many more concessions of the same kind have been made by those who have been most uncompromising in their attacks on the reigning theology! Churches of the Future have been planned in which the old Church has been freely used as a model, the centuries of Christian history have been found to be replete with admirable instruction—instruction to be found nowhere else; it has been discovered that our modern civilization has grown up, not in spite of the Christian Church, but out of and by means of it. Forms of worship adapted for the Church of the future are in preparation or expected, and it is thought that even though death be in reality an eternal sleep, yet it will not in the long run be advisable to say so; but that we must resort again to those "evasive tropes," of "subjective immortality," or "posthumous activity," or the like, which poor humanity has positively never had the fortitude to dispense with since the day when the shade of Achilles reproved Ulysses for "calling death out of its name."

Assuredly many more concessions of the same kind will be made in the future. As the sceptics, who hitherto

have had all the irresponsibility of opposition, begin to familiarize themselves with the practical aspect of the subject, they will discover that many dogmas, many phrases to which they have urged abstract objections, may yet practically be quite well allowed to pass, and at times they will feel ashamed of the tastelessness of their captiousness, which has mistaken poetry and prophecy for logic, and criticised the visions of enthusiastic hope as if they were meant for simple matter of fact. Their conversion would be greatly hastened by a little more generosity on the part of their opponents. If it were acknowledged not merely that much of what is urged in the name of modern science may be true even though it seems opposed to clerical formularies, but that it may be actually that addition to our religious knowledge, that further revelation which Christianity itself promises, then it would become still more readily comprehensible that the religious controversy of the age is not the internecine thing it seems to be, and that there is no reason to suppose that it ought to take precedence of all practical religious reforms, and ought to be settled before they can be seriously attended to.

Much has been said of a reconciliation between Religion and Science upon the ground of speculative controversy; but the terms proposed have generally involved the complete submission of one side or the other, with just some slight salve for its wounded vanity. In speculative controversy, where the only object is speculative truth, all such transactions are corrupt and illusory. What is needed is no such reconciliation between the specialists on both sides, but a proper contempt for the specialists on the part of practical men. Just as in great political crises the lawyers have been pushed on one side, so in great religious crises should the theologians and the scientists. And this would promptly be done if we had the same grasp of the substance of religion

which in some countries men have had of the substance of politics. For then we should know that it is the nature of the specialist to be one-sided, that he pays for his special knowledge in a peculiar ignorance of the value and the bearings of it, and that he can scarcely escape, even if he would, from the position and views of an advocate. Do we suppose that religion will be the better for being made the subject of an endless professional litigation? Will not the estate be swallowed up in the costs of the suit?

What this substance of religion is, these papers have been intended to make clear. They have laboured to show that no dogmas whatever, not even that of a future life, not even that of a (so-called) personal God, are of such importance that religious life must be suspended, practical religious reforms adjourned until the professional disputants can come to a conclusion about them; nay, that Christianity itself does not depend upon them so absolutely as is supposed. It is true, that if there is no future life for man the value of the present life sinks so much, that any kind of earnestness begins to seem affected and uncalled for, all moral systems and disciplines seem a waste of trouble; but even then we should remain Christians rather than anything else; even then, practical men would call it wise to make the best of a spiritual constitution, in which "nineteen hundred years have garnered up their hopes and fears," which has actually brought together, nursed and educated to civilization, all the progressive races—which has amassed for mankind an inestimable treasure of sacred memories, sacred thought, sacred imagination—rather than to supersede it by another, which after all the exhausting convulsions of the Revolution could teach nothing which could not be equally well taught now if the progressive character of Christianity were once restored to it. But if we stop at all short of the absolute negation of a future life—if we only think with Mr. Mill the hope of it worth studious

cherishing, then it becomes at once frivolous to allow the disputes of the schools to interrupt us in the work of removing the corruptions and improving the machinery by which the higher life, by which religion, is kept alive and spread among populations always gravitating downwards towards the life of the beaver, or fox, or swine.

There is but one consideration that could make us think otherwise, and it need not affect us much in England. When a religious system, great and true in its first conception, has merely fallen into the hands of a profession, and so been crippled and made petty, sentimental, and childish, nothing is needed but to rescue and restore it. But it may no doubt sink lower, so that its intrinsic merits can no longer save it, nay, positively increase the necessity of destroying it. If we looked at Christianity with the eyes of a French Liberal, if we saw it not merely hampered by a feeble clericalism, but made the tool of a powerful and subtle sacerdotalism, the case would be very different. Then we might say, it concerns us little what the original character of Christianity may have been. It comes before us as part and parcel of a system which crushes us. If it was originally beautiful and glorious, so much the worse; our enemy is made all the more mischievous by being dressed in such charms. We cannot afford to do it justice when we meet it in company with that which threatens us with destruction. An echo of this is heard in our English religious controversies. Charges are brought against Christianity which have no meaning here, but would be quite reasonable where Christianity is practically convertible with Ultramontaniam and Jesuitism. English Liberalism confounds its cause too much with the Liberalism of the Continent, and talks wildly, as if it were struggling with an organized cosmopolitan priesthood; nay, it actually turns against a Church dependent on the State the arguments and the invective which were originally used

against a Church whose offence it is to have practically deprived the State of its independence. A foreign definition of Christianity has crept in among us which identifies it with the organized Church of the Middle Ages. Such a definition is wholly out of place in a country which has for centuries drawn its religious inspiration from the Bible. To our people, the Church of the Middle Ages, that Church against the survival of which continental Liberalism struggles, is a thing which would be unknown, even by tradition, but for some cathedrals which witness of its glory, and for Smithfield memories, which attest the fierceness of its last struggles. The Christianity which has influenced us so powerfully, and is still so fresh in all our minds, has scarcely anything in common with that mediæval Church. It has, in fact, scarcely any connection with the Middle Ages. Its Bible is not a mediæval book, but a book of the ancient world restored to general use and knowledge in the Renaissance. Our popular Christianity has its beginning where mediævalism ends; its earliest traditions are of a struggle like that of modern Liberalism against spiritual tyranny; the great occurrences in its history are emancipations, resistances, heroic achievements, the defeat of the Armada, the Covenant, the voyage of the *Mayflower*, the emancipation of the slave. Priestly influence has here and there played a great part in it, as in Scotland; but the staple of its history, as of its Bible, deals with a resistance to priestly influence, and sets up the prophet against the priest or the scribe.

Let us not passively echo the party brawls of other countries as if we had not party brawls enough of our own. And let us not allow our own religious life to sink into a mere party brawl. Party life just now is at a low ebb among us, as well as religious life. There is a strong feeling that each may be enlivened a little by contact with the other. Sometimes we think we could almost feel religious again if we had a

good squabble about a conscience clause. Sometimes, on the other hand, we feel that we should have more enjoyment of our Liberalism if there were a Church to disestablish. Surely cynicism could scarcely be carried to a greater length than in the recent suggestion that the Liberal party might get back to office if the Nonconformists could see their way to an organized onslaught upon the Church.

If we sweep away the cobwebs of inherited prejudices and inveterate partisanship, we shall see at the bottom of these Church controversies a practical question of vast importance which there is hope of solving by union, but not by disunion. We see the struggle of the lower with the higher life.

If this phrase, lower life, or the old religious phrase, world, seems vague, let us translate them into the language of plain facts. We mean then that each class of society shows in its own way that when the mere cares of livelihood are satisfied, or if they are not felt, it does not know how to pass the time. In other words, it has no life beyond that of the animal. Is it vague to say that the lower classes *will* go to the public-house? This means that when they have their wages they can think of nothing else which they would like to do but to drink and chat. Is it vague to say that the middle class in general is given up to money-making, that the small part of their life which is otherwise occupied falls into humdrum uniformity without charm or freshness; that they measure men's worth and importance by their wealth, and that in choosing the occupation by which money is to be made they are generally ready to renounce any inborn preference or vocation for the chance of making a larger sum? Is it vague to say of the higher classes that they appear to have lost the high ambitions which used once not to be uncommon among them, that they are neither performing great public services nor setting the example they might set of a dignified, beautiful, and beneficent

life, but, their animal wants being satisfied, appear to desire nothing further except amusement for the passing hour, and strong sensations that may keep off *ennui*?

This is the want; what is wanted is the higher life. Now all Church organizations whatsoever exist for no other purpose than to supply it, to foster the growth of such life in men, to give it food and exercise. Churches are *not* societies of men bound together by holding the same opinions. No fancy more idle ever passed into a commonplace. Holding the same opinions is not in itself a tie to bind men together. If they agree, why should they come together? It is rather when people differ that they desire to meet. Churches are united as other societies are by a practical object, which is the desire to save men's souls. If indeed we allow a clergy to garble this phrase, and to persuade us that our souls are not threatened by the danger which is visible to all, the danger of being drowned in worldliness or animalism, but by quite another danger which we should never have found out but for a supernatural revelation, and which is to be avoided, not by the means which our higher instincts point out, but by quaint processes which seem to have something of magic about them, then no doubt a Church will come practically to mean the society of people who have been induced to believe this story. But this too is a consideration which is of little importance in England. The religious writers of the last age—a Maurice and others—have broken the neck of that superstition. It is widely diffused through all schools, and has passed into our religious atmosphere, that the heaven beyond the grave and the higher life here are identical, and that the revelation of Christianity is not different in substance from the revelation which comes everywhere in advanced societies to the higher minds. "Soul," and "saving the soul," mean the same thing in a Christian mouth, and in the mouth of any one who takes a high view of life. Without signing

any articles we may all take our place in the organizations which have this for their object.

If so, then let us look to see what progress they have made in their work. The vast achievements of the great spiritual heads of humanity strike the eye at once. They have removed the first great difficulties which philosophy might have continued always powerless to deal with. They have cleared a free space for the higher life to expand in. They have made room for it both in time and space. They have claimed for man's higher life a seventh part of his lifetime. They have set up everywhere the church, the Parliament-house of the Spiritual State, and they have created the clergy, the official class or administrators of the higher life. The beginnings are made here, but it should have been a matter of course that these were only beginnings. It should have been a matter of course that the work thus begun would need to be developed through centuries, that innovations and changes would be needed in each successive age, that the higher life itself would be found subject to variation and development, and that into ecclesiastical machinery as into political, abuses would creep, that here too usurpations of authority would be committed, and that there would be need to investigate a science of spiritual as of civil government.

But we have adopted quite another and perfectly irrational view of the subject. When we meet with deficiencies or abuses in this department, instead of considering how they may be supplied or corrected, it is our habit to wash our hands of the whole matter, sanctimoniously expressing our regret that we have not found ideal perfection where for some inexplicable reason we had looked for it. We adopt the same vicious method which we love to reprobate in the politics of foreign countries. Instead of persistent activity, unwearied good temper and timely reform, we adopt a policy of cold abstention and ironical reticence calculated to end in revolution. When

we find the clergy monopolising, as an official class will always strive to do, all functions, we do not resist them but take our revenge by remarking to ourselves with malicious pleasure that in reducing the laity to ciphers they are committing an unconscious suicide, and are destroying themselves by destroying the Church. When rival priesthoods tear each other to pieces, we are not alarmed lest the higher life itself should suffer, but rather amused because it gives us occasion to furbish up again some rusty sarcasms. And yet we do not really, if we will ask ourselves the question, wish to see all Churches fall into ruin; we do not really think that it would be convenient to begin again from the beginning; we shrink, when we take the trouble to reflect upon it, from the infinite discomfort that such a revolution would involve, from the despair it would cause to thousands at the time, and the well-nigh incurable prostration and debility it would leave behind it.

The practical question, if we can bring ourselves to take a practical view, is this:—Religion or the higher life starts with two great acquisitions,—what is the best use that can be made of them? There is the Sunday, and there are all the churches and chapels in Christendom with the machinery and *personnel* attached to them. We are not to begin by adding the Sunday to the week-days, secularising all the churches and unfrocking all the parsons in order that perhaps afterwards we may create a new set of institutions which will certainly be of the same kind. And if not, then it follows that we are not to help the Churches to destroy themselves. We are not to make a ring round the clerical pugilists and applaud their pugnacity; nor are we to say with studied decorum that we decline to assume any responsibility, only if the Churches see their way to committing suicide we are ready to lend them any assistance in our power and to place our party organizations at their disposal. But we are to consider how

these great institutions may be put to the best use, how they may be most wisely reformed; and if we find that clerical cliques have got complete possession and control of them, then to resist such usurpation by ordinary temperate methods.

Why then do these two great institutions, the Sunday and the Church, fail of their object? In a country where all enjoy them, why should the higher life remain asleep? A large space is cleared for it. Business is forbidden to absorb the whole field of our life. Why should nothing better grow there? Why should nothing but frivolity, or dulness, or, in a lower class, drinking, fill the hours that are not spent in labour? It is evident, surely, that though we have cleared the field we have not tilled it, though we have got the room we have not furnished it. The Sunday is there, but how terribly dull it is! The Church is there, but who can bring himself to listen to the parson? And yet it is not any defect in the quality of the food offered to it that makes the higher life languish. If not the parson's sermon, yet the sublime Book, the work of ages, and many a lofty Liturgy devised in later times, are precisely what one could wish and much more than one could expect. The deficiency is in quantity and variety. The Book itself, though it contains so much, yet does not contain all that is needed. However elevated its language may be, yet it was written two thousand years ago. We confess its insufficiency when we supplement it with a fresh discourse from a living mouth, but what a melancholy contrast between the inspired words of some ancient prophet, words for uttering which he suffered persecution from the professional orthodoxy of his time, and the modern sermon dictated and controlled by that very orthodoxy! But even if an Isaiah could speak from the pulpit as well as from the lectern, do we suppose that that alteration would suffice? Do we suppose that the higher life can live merely on

exhortations, however true and impassioned.

When we complain of the deadness of the higher life among us, what is it that we want? What changes would satisfy us? It is when we ask this question that we recognise the pitifulness of the clerical ideal. Those devoted evangelists, whether of the High Church or the Low, are labouring to bring the population into what condition? If they could succeed, the doctrines of Darwin and Strauss would be forgotten as though they had never been broached. In other words, we should think of the Universe and the Bible precisely as our fathers did, and all the thought and genius of the past age would appear to have been thrown away. Science would become a Bridge-water Treatise, Poetry would imitate the *Christian Year*, and popular literature would be governed by the Religious Tract Society. Who can picture this without seeing at the same time the irresistible mutiny that would follow in the next generation? Meanwhile our working class, instead of being jolly drunkards, would come "under concern" about the state of their souls and listen to revival preachers; young men of the middle and upper classes would begin to take orders freely, legislation would begin to take an ecclesiastical tinge, and the public mind would be convulsed with new Gorham Cases. Is this really what we want? Are these really the signs of His coming, and of a new birth of the higher life among us?

All this was pretty well realized about thirty years ago, and we have seen the insufficiency of it, and, what is more, we have lost it again. It is a paltry ideal, and one which cannot be held when it is grasped, simply because it is so flimsy. We are now all of us asking again, how shall the people be kept from the public-house? And some of us are asking also, how shall the dull Philistinism or emptiness of the other classes be healed? And we have made some steps towards the true solution. We say, it is not

enough to tell people to be religious, you must occupy their minds and give them a taste for something better than drinking. And we get up Penny Readings and Popular Lectures and Working Men's Colleges. Dimly at the same time we see that the deficiencies of the better classes are radically of the same kind and require the same remedy. What takes the working man to the public-house is the same defect which ties the city man to his desk and makes his life monotonous and unlovely. It is the ignorance of anything better,—the want of occupation for his higher life. And something begins to be done for him too. We have begun to purify the idea of culture, and to understand that we must present it for the future as something precious and beautiful in itself, and no longer merely as a means of success and money-making.

These are the new convictions which practical reformers have lately acquired. They have led to a practical rebellion against the clerical revival of the last age, for they amount to a conviction that no such revival can by itself regenerate the country. And the clergy are acknowledging this by enlarging their field, by taking into their province much which hitherto they regarded as secular. They do so under the plea that that which is in itself secular, such as music, architecture, popular science, may be made indirectly serviceable to religion. But meanwhile a great change and advance of opinion has been taking place among the professors of the so-called secular pursuits thus newly patronised. The future historian, describing the present age of English history, will mark it as the period when the English mind first clearly grasped the ideas of Art and Science. Look at our present clear conception of Art in its different varieties all equally to be honoured, the poet recognising himself as the colleague of the painter or musical composer in the same great guild, and see what a space has been traversed

since music was scarcely known and painting regarded as an ungentelemanly pursuit, while poetry acknowledged no connection with the sister arts, but rather classed herself with wit or with learning. In like manner, what a change since science asserted herself with the commanding self-consciousness which now distinguishes her! Not long since she lay huddled up indistinguishably with metaphysics and Greek scholarship and theology. Now she proudly stands aloof from all such association, and declares herself called to regenerate the world. Both in the case of Art and of Science it is a consequence of the new distinctness with which they are now conceived that their dignity is greatly raised. They take a religious character. The artist would be ashamed to speak of himself as a humble caterer for the public amusement, as, for instance, a Walter Scott always did. He is now in a manner bound to exalt his art if not himself, and to call himself a priest of the religion of Beauty. Nor can the latter any more be content to speak of science as an elegant and liberal pursuit; it is a point of honour with him now to proclaim himself a votary of the religion of the future.

It has been the object of these papers to piece together all these glimpses which in different quarters are opening upon the world, and divine the whole wide prospect which will shortly lie before us. When we see on the one side the clergy confessing the insufficiency, so to speak, of the fund upon which they draw, and adding to it, under various pretexts, much which they do not acknowledge to be religion; when we see, on the other hand, that precisely this new matter, which the clergy find they cannot do without, is at the very same time declared by those to whose province it belongs to have the character of religion, we are forced to some such conclusion as this:—

The old distinction between sacred and profane, religious and secular, was a perfectly just one, but a mistake

was made in drawing the line. The line was so drawn as to leave Art and Science among things secular, whereas they belong properly to things religious. And consequently the great religious reform for which our age is ripe consists in the full and free admission of Art and Science, their independence being at the same time preserved, to the honours of Religion.

I remind the reader that this reform is only a restoration of the primitive view. In the vigorous periods of religion it is inseparable from science, and finds its manifestation in art, and the traces of this are clearly visible in our own religion. Our Bible begins with a cosmogony which was the science of the Jews. All our earliest art is about us in our cathedrals and churches. The schism that has happened since has not really arisen from any wish on the part of Art or Science to put off their religious character, but only to become independent of the religion of morality or humanity by which they were controlled. They did not wish to be secular, but to be independent religions. And independent they must still be, only they must be once more recognised as religions.

Practically, what would such a reform involve? It means that all our penny readings and well-meant but too humble efforts to keep the people out of the public-house by amusing them, should be developed into that which they implicitly contain, namely, a full initiation of the whole people in the religion of Art; and in like manner that all our popular lectures, schemes of technical education, and so forth, should be developed into such a general initiation as is possible into the religion of Science. It means also that Art and Science in being recognised as religious should be made free of the Sunday; and that, in order to avoid a most deplorable breach with all that is sacred in the past, a most sad quarrel with our dead forefathers, the new institutions should not conquer their place by aggression upon the parish church and clergy, but should be

welcomed to it by their cordial invitation.

How many hesitating steps are constantly taken in this direction! Even evangelicals admit what High Church men have so long held, that religious services must become what they call more attractive. Here and there we have seen Science Classes opened in connection with cathedrals, clergymen lecturing on Political Economy. Something has even been attempted towards a reconciliation between religion and the theatre. And there is one conspicuous case in which the attempt, made in this case centuries ago, has had most important consequences. By means of the Oratorio a really fruitful alliance between religion and music was long since concluded. But it is not precisely such an alliance as this that is here contemplated. The question is not how Christianity may draw the Arts as captives in her triumphal procession, but of setting up the Arts in perfect independence to co-operate with Christianity in that work in which, whatever may be their quarrel with Christianity, they are her natural allies, namely, the work of stemming worldliness and fostering the higher life. In the recent discussion of the Sunday question it might be plainly observed how near the settlement of it was now felt to be, and it was also instructive to see in what confusion of words the opponents of the proposal took refuge.

Who now seriously argues that the Sunday is desecrated by attention to Art and Science? But it is strongly felt that the Sunday must not be abandoned to money-making, and an attempt was made to confuse the two things by pointing to the money that passes at the entrance to theatres and concert-rooms. Certainly, if Art and Science are not distinguishable from money-making, nothing will be gained by throwing open the Sunday to them, for it is precisely because they are antagonistic to the spirit of money-making, because they are wanted to fill the room which it vacates on Sunday, and prevent it from returning in

tenfold force on the Monday morning, that we call them in. We call them in in aid to Religion, or more properly as having themselves the nature of religion, and if they cannot be active on the Sunday without a little clinking of coin being heard, and an official here and there losing his Sunday freedom, the same is true of religion itself. A new church cannot be opened without increasing the amount of work done on Sunday, work for which money must be paid; and if it has nevertheless been found possible in the main to protect Religion from being corrupted by the spirit of money-making, there is no reason why Art and Science should not be protected in the same way.

And as Religion should share its day with Art and Science, so should it share its local vantage-ground and endowments. Hitherto it has done this in some degree. It has been the patron of primary education; but it has not yet had the courage to hold out the hand unconditionally both to Art and Science, and give them, without encroaching on their independence, an introduction wherever it has penetrated itself.

We are all anxiously considering how we may better the condition of the working class—whether for their own sakes, that they may get more out of their lives, or for the sake of the State, that it may be protected from the discontent that undermines it. What good thing can we give them? The suffrage? Increase of wages? Organization to protect them against capital? Or some share in the profits of capital? Or some share in the land? But all these benefits belong to the lower life. The utmost result of them will be more of that leisure, more of that spending-money which the public-house is always waiting to absorb. A much greater gift, rather the only gift worth the giving, would be the gift of new occupations, new pursuits belonging to the higher life. And when once we recognise, not faintly or fitfully, but with decision, that these pursuits are not exclusively

what we have hitherto called Religion, that they are not exclusively church-going, or hymnody, nor listening to clerical oratory or philanthropic projects; but that they include the two grand pursuits of Art and Science, religious also in the strictest sense, surely the prospect of a redemption for poverty and labour grows more distinct before our eyes. It becomes more clear along what road we are to travel, and we perceive the meaning of certain indications which have recently been given us. We have been told of popular amusements in use among other nations, which have often the nature of art, and which make the English traveller blush for the joyless life of labour in his own country; nay, when we have been told of the Ammergau Mystery, it has flashed upon us that Art itself may be born again, by being associated with Labour, as much as Labour by being inspired with Art. And what is the moral of that story of the Scotch peasant-naturalist? Even if you cannot perceive that that eager study of Nature is religion in its purest form, if it almost shocks you to hear it asserted that the Object of his worship was actually the True God, still you can hardly help admitting that such worship belongs to the higher life, and is the true counter-charm of the public-house.

Nor is it only for the sake of a disguise under cover of which they may make their way into the Sunday that we would represent Art and Science as having the nature of Religion. It is quite as much because they will never be rightly cultivated until they are recognised as in some sort sabbatical pursuits. When the clerical party brand them as forms of money-making, they only take advantage of the corruption which has fallen upon them from being treated as secular. Here again we only follow plain indications which the history of Art gives us. The work of Goethe and Schiller was principally directed to asserting a certain sacredness in Art, and to rescuing it

from the curse of commonness or vulgarity. So long as it is bandied about in the market, it does not perform its true function; it does not elevate. And is not this its fate among us? Who among us ever speaks of the elevating effect of Art? It is a conception quite foreign to our minds. We think of Art as amusing, or exciting, or thrilling, but not as elevating. And because we never question that it is a commodity to be bartered against other commodities, we make it up like other commodities for the market; and hence come works of the Dickens school, in which the most startling effects succeed each other without repose.

But will not Religion, in the old sense, or at least will not Christianity disappear, when so much hitherto deemed secular throngs into the precincts which were sacred to it? Would not this enlargement of the idea of religion prove a step to the destruction of it? Religion larger would be also fainter, until it was lost to view. Does not the truly religious man resent the suggestion that there is any connection whatever between what he calls Religion and Science or Art? Has not Religion a warmth, antipathetic to the hard and cold grandeur of Science? Has it not an awful solemnity still more alien to the frivolity of Art? Yes! but the fact that Christian feeling has a quality which is all its own does not prevent it from having another quality which it shares with Science and Art. Christianity has, and always will have, a jealousy of both which tends to become hostility; nevertheless, it is one with them in its resistance to worldliness and to the dominion of the lower life. It would gain much by freely recognising this affinity. In the first place, it would escape their attacks. Those negations of Science which are now so terrible would be very much qualified, if not wholly explained away, if Christianity appeared as the zealous friend of Science and the mediator between her and the

people; and the half-concealed rebellion of Art might be appeased in the same way. But it would gain also a more solid advantage. There is much too sharp a contrast between the insipid vulgarity of an ordinary English life and the height of the moral sublime in the New Testament. The higher life cannot be taught by presenting only ideal examples, or supreme moments of it. It is not all rapture and devotion, but has its routine and its ordinary occupations. These are wanting in our English religion, just as in our English Sunday there is nothing between dulness and divine service. And this routine of the higher life should be furnished by Science and Art, that is, by pure contemplations into which self-interest does not enter, while admiration and curiosity, the lower forms of worship, are kept awake. Formed in such a routine, would men appreciate the New Testament less than they do? Is it not evident that some such preparation, some such use of happy and peaceful thoughts, is absolutely demanded of those who would enter into the Christian view of life?

But suppose the population on Sunday flocking into picture-galleries and museums, and concert-halls; suppose even plays performed, not indeed the vulgar burlesques or loose comedies that pleased the theatre in its unregenerate days, but such as a Christian Æschylus might write for a Christian Athens, is it not evident that the parson, with his commonplaces, would be left to preach to himself in the deserted church? If it were so, if the church and the parson held their ground by means so purely artificial, would there be any hope of protecting them, or would they be worth protecting? But the considerations here urged do not lead to the conclusion that Art and Science, because they have the nature of religion, ought to take the place of what has hitherto been called religion among us. This has been asserted over and over again, but the view here taken is different. There is

another religion, which is neither Art nor Science, and which is more important to mankind than either, the religion of morality, or of the human Ideal, which in its historic form is Christianity. No rebellion would have arisen against this religion, still less would it have been possible to represent it as a womanish sentimentalism, if it had rested on its own merits, and not on the one hand turned Art and Science into enemies, by trying to tyrannise over them; and on the other hand, suffered itself to fall into the hands of a profession. Give back to Christianity the elasticity and the modesty of which clericalism has robbed it, and it will appear again in its proper place, that is, the highest place among the religions which compose the Higher Life. But, as religion is larger than Christianity, even when Christianity is most justly conceived, so is the true Christianity far larger than the clerical perversion of it. If it is the religion of the human Ideal, and of the human race, evidently the material of it must be all human history, and all the sciences that deal with man. It must not confine itself to a narrow strip of history, the chronicles of a single tribe, or to the narrow thought and science of that tribe. The founders of Christianity connected with their religion, at least, the whole history of the race to which they belonged. They drew no distinction between ecclesiastical and civil history. We, with our wider knowledge, should take not narrower, but still wider views. While we see in the origin of Christianity the highest point in the history of humanity, the simultaneous revelation of the Ideal and of the Race, we ought to reject no part of the history of humanity, nor to imagine that some of that history is sacred and some profane. In like manner, while we regard one type of humanity as the highest, we ought not to imagine that only one type is worth study or imitation. And when these narrownesses have been avoided, why should the preacher of

Christianity fear to be [dull? Why should he want topics, or dread the rivalry of Art and Science? The whole history of mankind is open to him; or, if such catholicity is beyond his conception, at any rate he has the whole history of Christian nations. In what sense can Jewish history be sacred in which the history of Christendom is profane? Teaching on the duties of men, illustrated by history, and connected with a grand consecutive view of the plan running through human history—why should we fear that men would turn a deaf ear to this? They would not do so if they could once rid themselves of the suspicion that the teacher is fettered, or but half sincere, or but half competent.

This view of the coming phase of religion is realistic, and therefore has its shadows. It exhibits religion not as a kind of sacred asylum from all the anxieties and almost all the activities of the mind; not as giving all that the intellect desires while it absolves the intellect from trouble—conclusions without reasoning, knowledge without investigation, and poetry without imagination;—but only as an asylum from worldly and material cares. More than this: it does not promise that religion will, in its next phase, render with any certain efficiency that service for which alone many have valued it. Religion may become less potent in consolation, and less able to inspire the hope of immortality into souls not naturally ardent. Those cold misgivings which hitherto have been thought incompatible with all religious beliefs, that there is, after all, nothing "behind the veil," will beset the religious as well as the worldly, as they seem to have done in Old Testament times. In that voyage towards a colder zone on which we are all bound, the story of some discoverable North-West passage will be less universally received, and some will affirm that no land, after all, is to be found about the Pole, but only a Sea of Ancient Ice. Is it possible, it will be said, that any religion worthy of the

name can subsist amid such uncertainties? And yet religious faith and peace have lived on all this time in spite of an opinion about the future infinitely more appalling than that. Meanwhile, this very uncertainty about immortality, this very aversion of the religious life from the future, will lead to one good result, which perhaps could hardly have been attained by any less painful means. Religion will now, for the first time, fairly undertake that regeneration of the present life and of actual society which it always promised, yet always indefinitely postponed; and in doing so it will, as we have seen, reunite itself with those other inspiring influences from which it ought never to have been separated. Religion will once more be understood as the general name for all the worships or habitual admirations which compose the higher life. We shall no longer be told of high feelings which make men unselfish and pure-minded, and raise them

above vulgar cares, but which, nevertheless, have nothing to do with religion. We shall no longer hear it said of some man of science, whose mind is possessed, beyond most men's, with the thought of the eternal laws by which the universe is governed, that "it is to be feared that he is an atheist," nor of some artist, whose heart is touched by a thousand sights which leave other men cold, that "he has no religion." All such high enthusiasms will be recognised as having the very essence of religion, and they will be prized the more rather than the less for appearing in the instinctive, inarticulate state. But of all such enthusiasms it will still be held that the highest and most precious is that which has man for its object, and which manifests itself neither in works of Art nor discoveries of Science, but in emancipations, redemptions, reconciliations, and in a high ideal of duty; and this is the religion which bears the name of Jesus of Nazareth.]

DOCTEUR LAVARDIN; A SKETCH.

I.

"Patitur qui vincit."

DOCTEUR LAVARDIN had succeeded in his profession in a way that made more aspiring men envious, his success being due in a great measure to his want of any low ambition. The lamp in his room might be seen burning until the small hours, as he bent over his books and microscope, patiently and enthusiastically searching out the secrets of pathology. His contemporaries pitied him as a man of brilliant promise, stifling his chances by living the life of a hermit. One eminent Parisian doctor, a good deal his senior, took him to task in a kindly, patronising way, and remarked that he would never get on unless he gave good dinners, and gathered around him a fashionable *clientèle*. "When I was your age, I was apparently as successful as I am now, though I had then to think a good deal more about my creditors than my patients; but the game was worth the candles—nothing succeeds like success; behold me now, physician in ordinary to His Majesty the Emperor, cross of the legion of honour, and received in all the best houses of the *beau monde* of Paris. You have the same chances, if you go the same way to work." Any one less self-satisfied than this counsellor would have observed the half-suppressed ironical curve on the lips of the younger man, as he gravely and shortly thanked the elder for his well-meant advice. Ten years later the emperor was not, and his physician in ordinary, having got into serious money difficulties, through his extravagant living, had borrowed largely from Dr. Lavardin, who had then attained a foremost place among the medical men in Paris by sheer hard work.

He had learnt to perfection the great professional art of listening, and treated every case that came before him, whether of gentle or simple, as the most important in hand. He rarely claimed sympathy from others; when he did sacrifice his natural reticence, it was more to place himself in closer communion with the suffering, than for any other reason. There were some who pre-supposed that beneath his simplicity and truthfulness there lay unfathomed regions of astuteness and worldly wisdom. It was not so, however, he had simply the wit to know how to play the card of truth with tact. In his dealings with sick men, he found it necessary to be abrupt, sometimes to harshness; in most cases cutting them off from a good many selfish pleasures, and frankly telling them that keeping to their work would answer as well, if not better, than a visit to Monaco, or a trip to Vienna. "As for me," declared a spoilt boy of forty, "I can do nothing unless I am in perfect health." "If all acted on that principle, I fear there would be little work accomplished in the world," the docteur had unfeelingly replied. Women, whom he influenced, looked and felt invigorated by his medical advice; those of them who expected him to order their lives according to their wishes always came away with their fees unaccepted, and in time these ladies drifted into the hands of more amenable practitioners.

The relation of such a human being to the world around him must always be full of peril. But the peril is infinitely increased when the protected character of the physician comes into play. It was not until he had reached middle life that Dr. Lavardin felt any danger to himself in his position.

The young wife of one of his staunchest friends had come to him for help and comfort in her wretchedness. Her husband, M. D'Hauteville, and Dr. Lavardin had been at school together, and each had achieved a brilliant reputation, D'Hauteville especially had been in the habit of carrying all before him. Later on, success had become not only a habit, but a necessity to his nature. He lived on the excitement of it. During the final examinations, however, at the École Polytechnique he could not keep step with Lavardin's steady pace; he became worried and discontented, and soon dropped from even his second place. Lavardin little cared for these competitive successes. He wanted to know things well, because he really cared for the knowledge, but not for the sake of out-distancing his friend. At last came the examination for the coveted mathematical prize—the race was between Lavardin and D'Hauteville. Lavardin knew the prize lay within his own grasp, but, to the surprise of every one, he did not send in his papers on the plea of ill-health, and to D'Hauteville the honours were awarded.

"You were ill on purpose," said D'Hauteville, but the other only laughed it off. "Take my word for it, you will never get on in life if you cede to others—if you let your heart take the place of your head."

"We will see," replied Lavardin, with quiet confidence. "You lay too much stress, D'Hauteville, on the prizes of life; remember there is always a price to be paid for them."

D'Hauteville was now an overworked rising *avocat*; his rich marriage was generally looked upon as one of his successes, yet he had not filled the wide blanks in his wife's passionate, purposeless existence. She had found that her union with him, instead of being the realisation of all her young dreams, was but the abrupt awakening to a series of disillusion, to sterner responsibilities and duties, to additional perplexities and fears.

She had no children to occupy and engross her, no method of life, no pressing necessity to live for others. Her husband, too busy to be with her much, and trusting in her innate goodness, left her free and unquestioned liberty, while he drowned his own heart's disappointments in the absorption of his daily labours—in his hard-won successes. But she had no absorbing work, and her health gave way.

"Go and consult Lavardin, he will put you right; he is the best friend I have," said her husband, hurrying away with his briefs, after bestowing a passing kiss on her pale, cold brow. So to the physician she went.

She was very lovely, very pathetic, very desolate; with a wide capacity for happiness, for loving, for living. Dr. Lavardin's heart was touched and thrilled. He would fain have dismissed the case, and so guarded his own inward peace. But he could not. He was at first severe, introduced philosophy, told her that happiness is not a thing to be claimed, but that life is both possible and bearable without it. He spoke of Time as the Great Healer, the great modifier, and that we must have compassion one for another. But as visit followed visit, these truths seemed to heal her wound but slightly. Feeling he had been too harsh, he spoke again more gently, until she lifted up her eyes to him with a look he never forgot; then his breath came quick and short; he turned towards her passionately, advanced, checked himself, and wearily sat down in the furthest corner of the room. He occupied himself for a moment in writing, and as Madame D'Hauteville passed out, and the next patient came in, it would have been impossible to discover from his calm manner that he had passed through any inward conflict. *Patitur qui vincit*. Dr. Lavardin suffered, yet he was loyally true to his friend. He became more tolerant, however, to all strictly human and momentary weaknesses. As a young man he had been very hard against any lapse from his own high, untried

standard. All young people are pitiless, until they learn through experience the truth of that wise saying — *Tout comprendre c'est tout pardonner*.

The next news that his patients heard of him was that he had quitted Paris and gone to Amiens, where the cholera was raging, and where doctors were needed. "What a quixotic fool the man is to throw away such a practice to get killed off by pestilence in the provinces. A capital first plunge for beginners, no doubt (to be killed off), but for a man like Lavardin!" So exclaimed the faculty, so mourned his *clientèle*. It was not quixotism, however; doctors are human, though the fact seems sometimes to be forgotten; and no power would have induced Dr. Lavardin, in his calm senses, to remain in a position where he had the slightest doubt of himself. No one was dependent upon him in Paris; his private practice, though very lucrative, was not what he cared for most. His heart was in hospital work, and he was eager to try new remedies for stamping out the prevailing epidemic. The cholera did not cut him off as his friends predicted, and he lived to experience in himself what he had taught to others, that life is both possible and bearable without any particular happiness. He got greyer, however, and settled more decidedly into a scientifically-abstracted middle-aged man, and after the excitement of the cholera had subsided, he in a measure gave up general practice and lived a studious, though a benevolently useful life. The good people of Amiens were very grateful to him for his self-sacrificing devotion during their time of trial, and highly gratified that he was content to take up his abode among them. It showed how quickly appreciative he was of their high moral and intellectual standard, and the generally advanced opinions of the town. Dr. Lavardin became very popular in the *cercle*, though he neither played high nor gossipped, and was very often asked out to dinner,

though he was not a professed talker, and had no self-assertion. Those who gave him the benefit of their ideas would remark in a delighted way, *Il est vraiment fort spirituel*; though the docteur had in all probability confined himself to expressions such as *bien possible, mais oui, mais non, cela s'entend, précisément*. From his sympathetically genial manner he seemed but to refrain from carrying all before him in order, benevolently, to give younger ones a chance. It was only Sidonie, his housekeeper, who knew how much of ease and energy, sweetness and strife, there was in his nature, and she loved, feared, and respected him for his self-control. The townsfolk thought it a mighty piece of good luck his getting such a treasure; even M. le Curé had not a better cook, and at the same time it was considered a great chance for Sidonie being under such a master, *un homme comme il y en a peu*.

Sidonie's father had been a well-known manufacturer of the town; long failing health and unfortunate speculations had reduced him to a state of bankruptcy, and obliged his children to make their own way in the world. On the whole, his family had done well, walking uprightly along the straight high road of life, every one of them except Sidonie (whose character was a mixture of pride and impulse); she had taken, alas! a wrong step on that hard, pitiless road. Her lover died, and for a time she felt all the bitterness of lonely poverty and all the anguish of a proud, dumb despair. Other ways of gaining a livelihood failing her, she succeeded at last in becoming a first-rate *cuisinière*; and as time went on it was she who superintended all the grand repasts served in the town, and recipes revised by her were considered of priceless value. She maintained herself and her child with reticent dignity and independence; indeed there were some people who quite resented this steadiness of behaviour, deeming it an irreconcilable inconsistency. It was only the more liberal-minded who recog-

nised that she was no ordinary woman ; in fact, with her reputed book-learning, and her grave, dignified manner, she passed as a rather awe-inspiring personage. When Dr. Lavardin first saw her, in a formidable high cap, completely hiding the shape of her head, and her heavy grey cloak, he gave a little inward laugh, almost mis-doubting the rumours he had heard concerning her past life, doubting too whether this delicate-minded lady, with her deep-set eyes and tensely closed mouth, would exactly suit his situation, would unquestioningly obey his behests : for our docteur, though mild, was a mild despot. As Dr. Lavardin stood, with his plump sunburnt hands crossed meditatively behind him, reading by slow but sure degrees the characters of her face, he startled her self-distrust by abruptly offering extravagantly high wages. Her pale cheeks flushed, but with more pain than pleasure.

"I am not worth that," she said ;
"I cannot take so much."

"I think differently," he answered ;
"those are my terms ; I shall not change them."

She looked up in his face with wounded pride.

"You are doing it because you are benevolent ; but I am not a subject for benevolence ; I wish to stand alone, and take but what I rightly earn. I ask only for justice."

"And I consider I am barely doing you justice. Believe me, I am not acting under the impulse of benevolence, I am only giving way to my instinctive knowledge of character." This he said with diffident persuasiveness. "None of us have justice done us," he went on, dropping his eyeglasses, and looking down at her smilingly, but with dimmed eyes ; "we are always either over-rated or under-rated ; for instance, you have under-rated me, in considering me more generous than just."

Still she protested, still he insisted ; she would have her way, he his. It was the first and last battle between

them. Of course the stronger gained the victory, and to Sidonie there only remained the hope that, by her devotion to his interests, she might in some small degree repay her master's generosity. When the interview was over, and she had passed out of sight into outside darkness, the severe mouth relaxed, and as hot tears sprang into the impetuous eyes, she bowed her head, crying out as if in pain, "My boy, my boy."

For this satisfactory arrangement with Dr. Lavardin necessitated a mother's separation from her child. What money, or what assured position could make up to her for her son's loving caresses ? As she passed through the lamp-lit streets, her cloak in the sleeting rain clinging damply round her, more than one wayfarer paused, but passed gravely by, on observing the maternal solicitude imprinted on her face.

II.

"He cared not only for 'cases,' but for John and Elizabeth, especially Elizabeth."

MOTHERS recognised at once that Dr. Lavardin was too staid a subject for any matrimonial project, so were happy and at ease with him, and guilelessly expansive, making what use they could of him. Passing over their daughters, they enlarged to him about their difficulties with their sons. One or other of them would naively ask him to find some situation in Paris that would suit her eldest boy—a berth with good emolument, little work, advancing prospects : her son, she was sure, would make a good *attaché*, a rare diplomat, a wise leader of men, if only he had an opening. Dr. Lavardin, as he listened to this fond mother, looking over his spectacles with a serio-comic gleam in his eyes, would never fail to soothe her by gentle compliments, sometimes even unwittingly stroking the fair hand in a grandfatherly way. And however elderly or stout the

lady might appear to other eyes, she was sure to have an agreeable consciousness that the docteur admired her, and in truth he did admire the maternal love that made her courageous to ask favours. He did what he could, for no woman ever appealed for help to him in vain.

He would tell the husband in his business-like way of a cashier's place, or a vacancy for a medical student. There were no flatteries in his speech to the man. "The duties are hard; but all work is hard." The father might think that it was very easy for him to talk thus, living in ease and comfort with Sidonie as house-keeper. Yet, after toiling all day, had not the evening of life set in for Dr. Lavardin? Why should he not enjoy complete and remorseless leisure? It was not by chance that he had gained his money and position, but by the sweat of his brow, rising with the dawn, and working far into the night. And now he was supposed to have lived his life, and was going to devote himself to the study of scientific subjects. So the Amiens folk glibly explained the situation. How very ready we all are to shelve our friends, while for ourselves—ourselves—how difficult to realise that we have in truth lived the best part of our lives—we expected so much, and we have?—what we have worked for. We reap?—what we have sown. But why should Dr. Lavardin ever admit or allow others to assert that the fullness of life was over for him? Surely as long as the beating of his heart goes on evenly and strongly, existence with its mysteries and miracles, its passions, and pains, is still before him. What though he has gained a certain amount of philosophic calm—he can still feel the sunshine and the shadow, the blue sky still bends above him, the world surges around him. There is twilight and night, and the long lonely hours of dawn, when his heart feels desolate—ill at ease—longing

for something which has not come to him, has not been attained—dead to scientific problems—

"Blank to Zoroaster on his terrace;
Blind to Galileo on his turret."

So mused Dr. Lavardin as he wended his way to one of his lady patients, who had neither daughters to dispose of nor sons to settle in life. She was not, however, one of the women whom the docteur influenced, nor yet was she of those who retired from his consulting-room with their fees in their hands, for the very good reason that she never brought hers; she was one of those licensed ladies who "remember to forget" to bring their purses on special occasions.

En revanche, her welcome to Dr. Lavardin in her own house was of the sweetest and easiest. She was charming and amiable, wishing no one ill, except those, of course, who stood in her way, and all she did then was to push them gracefully but promptly aside. Though left a widow in comfortable circumstances, she, like many others, would have liked more money, could have easily disposed of it, on herself as the jewel, and on her house as the setting of the jewel. As it was "she did her best," as she often told Dr. Lavardin with a plaintive sigh; and he, looking at her and her elaborate setting, sadly re-echoed that sigh. Once on his return from visiting the wretchedest part of the town, amid vice, fever, and death, he had been simple enough to preach her a little sermon—invigorating, impetuous, fervent; inveighing against the temptations of unshared riches—the banefulness of egoistic lives. As he talked he got white and tremulous, walked about the room, looking fiercely in earnest, his face luminous, searching. He stretched out his big brown hands as if to shake her out of herself. An answering movement, a glance of understanding, a checked utterance of impulsive sympathy, might at that moment have

subdued and thrilled him, perhaps captivated him for ever. But the widow was calculating, not listening—"His voice is too loud; he is too large for ordinary-sized rooms; I should hate to have scenes like this; I like repose and darkness, and it is simply *agaçant* his drawing up all the blinds." This she said to herself consolingly, feeling him drifting out of her reach—beyond her depth. "Decidedly he has passed his first youth," was her after deliberate comment, as she gracefully set herself to answer him, and to enlighten him with her own ideas of life and love, duty and friendship—her aspirations, her hopes, her fears, her sensations—herself (for she, too, could perorate on her own pet subject). But she had let slip her moment. It was not given her to interpret the expression of eyes intrenched behind their spectacles, nor the movement of lips covered by so thick a moustache.

Such were the little shocks that Dr. Lavardin received on his passage through life. Yet his faith in human nature did not die out; he still went on hoping and believing that "there's perfect goodness somewhere;" always attributing his disillusiones to some want in himself. He still continued to visit the widow in her scented and softly-cushioned boudoir, listening with a wonderful patience to her monologues, and prescribing mild *tisanes* against a too introspective and luxurious life. Perhaps he hoped in time to influence her—or was it that she was gradually converting him to darkness and repose?

Sidonie had a strong conviction that even the best of men are apt in the end to fall victims to a woman's persistent flatteries; and as the visits went on she trembled for the fate of her master; for what are poor mortals to do but accept, in default of better, something lower than the angels—accept the graceful acting of a feigned love in lieu of the unbecoming and benumbing diffidence of a deep reality. She was aware of this possible phase

in men's lives, and in silence waited for what was to come. Being one of those who have felt the heavy clouds of suffering, she was quickly grateful for passing sunlit gleams, and therefore was not going to "forestall her date of grief;" but by fulfilling the claims of every day as it passed maintained her own inward peace. In accepting God's will, knowing that He was great and good, she prayed for the welfare of her master, believing him also to be great and good; and thankfully remembered how she had been sheltered and set on high from the world's rough ways, from women's hard looks, and from men's light words; she had basked securely in the sunshine, and she was not now going to complain because the clouds were again gathering around her.

Possessing still a rich mine of wealth in that maternal love which no one could take from her, she found courage and strength in watching the vigorous young life unfolding itself before her. In her boy's innocent prattle and broad, trustful smiles she drew her comfort, feeling she had her share of love. When the day's work was done her child would occasionally be brought to her, and in a little sanctum opening out of the kitchen the mother and son would have quiet play together in the dancing firelight. They were sitting thus beneath the shadow of the great clock-frame when Dr. Lavardin returned home from one of his visits to the widow sooner than was expected. She did not hear the door open, and was softly singing—

"Dis, quel est l'amour véritable ?
Celui qui respire en autrui.
Et, l'amour le plus indomptable ?
Celui qui fait le moins de bruit."

It was the same Sidonie. The only difference in her was that she had her child on her knee and had forgotten all household cares. Her cap had fallen off, and her usually tightly-imprisoned hair fell in heavy masses on either side of the fine outline of a

noble head. One of the boy's hands had fast hold of a twisted plait, while the other lay sleepily upon her bosom. Dr. Lavardin did not speak, but stood leaning against the doorway, watching, fearing to break the spell. He had seen women under many phases—under the influence of various conflicting passions—radiant with the might of love—dimmed and shrunk with the strain and conflict of self-suppression—glorified with victories over temptations—repellent with the pre-occupation of an intriguing mind. But never before had he beheld a face so transformed as was Sidonie's with a pure maternal love. All the severe outlines had disappeared, giving place to dimples and smiles, while the unconscious cooings made a happy rift in the austere line of her mouth. The child took it in gravely and as a matter of course: for when had his mother's eyes looked at him otherwise than softly, or when was her voice other to his ears than the sweetest of all music? Only he nestled closer in the infolding arms, and beat time with his fingers on the gently-heaving breast. But to Dr. Lavardin it did not come as a matter of course.

"You must always have your child with you, Sidonie," he said, speaking and drawing near, though he had meant to have kept silent and retired. "I ought to have thought of it before; but it is your fault; you spoil me and make me selfish. See how the little one has clasped my finger and will not let me go, recognising a friend, though a tardy one. You know we have plenty of room for him. I make one condition, however, of his becoming a member of our household."

Sidonie looked up shyly perplexed, into a grandly beautiful face, into love-lit, compassionate eyes.

"Which is," he went on, in a mock voice of command, "that you never again wear a cap."

She bowed her head, and touched with trembling, fervent lips the hand held prisoner by her child.

III.

"All people have sometimes a season of mental desperation and aberration, when they do exactly what their friends would least expect."

It was the early, buoyant morning. The widow's casement was open, and in a loose luxurious wrapper she was leaning out, resting her languid elbows on the window cushion. Beneath, in the busy street, amid odorous piles of fruits and flowers, bright costumes, and shrill voices, passed Sidonie on her way to market, her crown of glistening braids wound round her well-poised head, her dark, subdued face illumined with an intense inner light. She was in the crowd, but not of it. There was a new rhythm in her carriage, a stately cadence in her walk, that at once arrested the widow's attention, who, after gazing intently down at her, suddenly closed the window, and, with a sharp energy and dangerously sparkling eyes, began the mysteries of an elaborate toilet. It was not the toilet of a woman in dubious anxiety, with passionate pulses, intent on beautifying herself for the sake of him she loves, nor yet that of a gentle, guileless maiden, watching in the mirror the reflected curves of her white arms, as she lingeringly gathers up the glory of her tresses. It was rather the deliberate adornment of an experienced coquette, where there was neither innocence nor passion. The widow was not readily prepared to part with her newly-acquired liberty, nor to withdraw the plausible veil that screened her self-indulgent life; she only felt the need of a more piquant interest in that life—a fresh proof that her powers of fascination were not on the wane. If she did not greatly care for Dr. Lavardin, she at any rate greatly cared that he should not go to another. As she put the finishing touch to her reddened lips and the delicate shadow beneath her eyes, she had worked

herself up to a pitch of almost righteous indignation. To save Dr. Lavardin from his impending fate would be a deed of charity—an act of grace.

Before Sidonie had returned from market the widow was in the docteur's study.

"I am going the round of my friends, begging for this sad case of starvation," she said, in soft, persuasive accents.

The appeal had been drawn up that morning by herself—the work of her ready imagination—the quick inspiration of a moment. Though the case detailed was a purely fictitious one, she truly meant to give the money she received to the needy, and in after-confession to her priest would omit no tittle of the lies told for so good a cause, believing, as she did, that the end justifies the means.

Dr. Lavardin received her with open arms; he felt that morning as if he could take the whole world into his embraces. He did not sermonise; indeed, was quite touched by this newly-awakened consideration for the poor, and felt remorsefully that he had perhaps done her injustice—had been too hard upon her with his sledge-hammer. Here she was, up and dressed betimes, looking almost lovely, and was bestirring herself for others. He himself had idled away the morning hours; Sidonie had not yet shown herself; all night he had dreamed fitfully of a mother and child—of a tangible happiness for himself—of sweet, flickering smiles on a chastened face. And now he was impatient—expectant, feeling alternately joyous and irritable; and there was nothing and no one to wreak his passing spleen upon until she appeared—this lightly-glancing, softly-speaking fairy, scented and furbelowed.

After perusing her document he looked down at her searchingly, hesitated an instant, and then, as if ashamed of his hesitation, blushing placed a bank-note upon the paper.

"Thanks, thanks," she exclaimed, drawing close to him, and placing her hand in his. "Do you know," she went on, in a broken, die-away whisper, "that they are talking of you and me in the town? They say you are going to marry at last."

The hand that inclosed hers burned; but before he could speak Sidonie came into the room with the morning letters.

"Adieu, then, and thanks for your contribution," concluded the fairy, disappearing amid soft undulations of drapery. "I need not have taken so much trouble nor have gone so far," she thought, as her careless glance fell upon the grave, colourless face of Sidonie, whose faint voice seemed to come from some difficult distance as she answered the other's complacent salutations.

After leaving Dr. Lavardin's house the widow's intention had been to go direct to the alley so graphically described by herself, and there have persuaded some one or other into the belief that they were starving. But the heat was excessive, the way was long and uncertain, and her breakfast waited for her at home; besides, her reception by Dr. Lavardin had been most flattering. What need for further trouble?

Sidonie had certainly paled under the other's glance, seeming no longer the same woman that had passed on her way rejoicing, illumined with the gladness of the morning; yet, in the might of her love, she felt strong. As she shut herself up in the kitchen, which looked in the garish daylight so bare and commonplace, she began at once her round of duties—the wholesome necessary daily work that makes life possible to so many crushed spirits. For a moment she held her breath, as she heard Dr. Lavardin's step in the hall—a quick, eager footfall—but he did not come to her; he passed out by the front door. For a moment she gave a stifled sob, and then, arrested by a little echoing cry from the cot in the chimney corner, she turned to

meet her child's wife, wondering eyes ; awakening from his dewy sleep, he was ready to take his cue from her for laughter or for tears. She smiled at him, and talked his childish language, while he answered in his piping treble. She would not take him up, however, till she had finished her work in hand ; he must have patience, and she too. And when afterwards she bent to raise him, and felt his rosy lips pressing hers, and the eager little arms twined about her neck, she told herself she had been ungrateful for the wealth she already possessed.

Dr. Lavardin lost much time that day in the town, trying in vain to find the name of the starving people for the purpose of administering instant relief. On the other hand, he gained a good deal of interesting information about himself.

The widow had certainly been correct in her statement concerning the rumours afloat of his contemplated marriage.

"Yes, I certainly am thinking of taking unto myself a wife ; *mais vous autres*, you seem to know more about it than I do myself."

This he said laughingly to his friends at the *cerce* ; then he was about to hurry home, but was called back for a consultation, and did not regain his liberty till late in the evening. In his own house his study looked bright and inviting, but he passed on to the room beyond, paused for a moment on the threshold, and then entered.

Sidonie was sitting on the same low chair by the fire under the tall clock, but instead of her boy on her knee, she was deep in the study of Pascal's *Pensées*. She had forgotten her cares and herself, and, like a child entranced with the newest story-book, she sat isolated and absorbed in the pages of the closely-printed volume.

"That is mine," said Dr. Lavardin, coming behind her, and taking the book gently out of her hands. He drew in a chair, and began reading it

aloud. But his voice failed him. "I am tired," he said, carelessly ; "you go on with it." And he threw his head back into the shadow, and watched her while she read. Clearly and firmly, and with unhesitating distinctness, she began at once, her sweet soothing contralto forming a marked contrast to his uneven bass. He had been self-conscious, and had had truant thoughts, but her mind was dipped deep in the subject-matter, and she was only conscious of obeying his behests. And so the reading went on, filling the room with reposeful harmony, until the lamp flickered, flared, and finally went out.

"Now we have only the firelight," said Dr. Lavardin, leaning forward, and again possessing himself of the volume and the hand that held it. "Sidonie," he went on, "I came home worn out and worried, and this hour has been so full of rest and refreshment. You have been much to me already—very much ; will you not be more, and crown my life with blessedness by becoming my wife !"

She lifted her sorrowful face to his.

"I am not worthy to be your wife," she said, trying to withdraw her hand from his firm clasp ; but he only held her closer.

"Listen !" he went on. "I have traced and learned by heart your life from the time you were left motherless, and with a father powerless to protect you—there have been headstrong impulses at work—much self-sacrifice—sorrow which purifies. What has been—has been." His voice broke, and he pressed her hand over his burning eyes. "Ah, would to God we had met earlier in life, when we could have helped one another."

"But it is too late now," she said, with mournful resignation.

"No, it is not," he replied, turning upon her suddenly, with a radiant countenance. "It is never too late.

You have already attained that peace that comes only to the few who

"Have learned to tread the narrow way That leads through labour to the light of day."

Help me to find it; let us labour together. For I too have had experiences that might make me unworthy of your love; but we cannot judge one another by isolated acts; we must look to their whole lives—the standard they set before themselves, even though they fail to attain it—the truth and sincerity of their motives, though circumstances and the world's harsh judgment may set against them like the relentless currents of a strong tide."

He did not press her for an answer, but they sat together through the darkening hours, hand clasped in hand, like way-worn travellers, who have at last reached a longed for bourne of safety and repose.

Dr. Lavardin's parting words to his friends at the *cercle* caused quite a stir of excitement; the news spread like wildfire, with additions and emendations—"Impossible!" "Who is she?" "An old friend!" "No, the widow; I foresaw it long ago." "It is an arrangement." "On the contrary, it is entirely a love-match, with some one quite young, in fact a long attachment." "I don't believe there is a word of truth in it; Dr. Lavardin is only laughing in his sleeve at us—these Parisian fellows will say anything—*capable de tout*." And so there was confusion and discussion, every one professing to know the ins and outs of the case better than his neighbour.

The news was a nine-days' wonder, and before the mystery was solved the two whom the gossip most concerned passed amid the clatter of tongues and sabots, and the clanging of many-toned bells, quietly and unnoticed on their way to church, there to be united in the bonds of holy matrimony.

When the travelling carriage containing the newly-married pair had

rolled out of town, the loungers shrugged their shoulders, and touching their foreheads, indicated significantly that "the season of mental aberration" had set in for the docteur; while the women in their *salons* began tardily to realise the fact that this clever, kind, good man had been veritably looking out for a wife all the time he was among them. What was the use of old maiden ladies with their powers of contracting matrimonial alliances if they thus let slip so good a *parti*, and what was the pleasure of hospitably entertaining influential priests if they did not look better after the interests of their flock?

"*Tranquillisez-vous, mes chères âmes,*" gallantly replied one of these much-abused agents; "Sidonie was the only woman who would have suited our friend, and in marrying her he has shown himself neither so clever nor so subtle as we believed him; and as for his goodness! he seems to have trifled inexcusably with the widow's affections. The fact is, concluded this *débonnaire* prelate, "that he is not quite up to our Amiens standard."

The docteur little dreamed that while he was giving himself his first holiday in life, and, like a boy released from school, revelling in the delights of new scenes and cities, new languages and faces, that he was the subject of so much comment and speculation at Amiens.

In due time he returned with his wife to his own country, and settled once again in Paris. Many men—most very successful men—would have shrunk from the idea of coming back to the scene of their former triumphs, taking the risk of being forgotten—of being overlooked. But our docteur was very philosophic on such matters, and quietly returned to his old house, and to the same life, "but with such a mighty difference," as he gleefully remarked to Sidonie, who one day was shyly and anxiously questioning him if he did not regret the former excitement of occupation.

"Your voice and the boy's voice are

what I care for most in life, and after that to be supreme in the biggest hospital, and I have got my ambitions gratified, and am very happy; the world takes up a fashionable medical man at forty, and may whirl him along till fifty-five, if he can stand the strain, and then he is dropped as suddenly as he is taken up. Now I have dropped myself, and yet somehow I feel that I have risen. I am wedded to you, my Sidonie, and not to a fashionable *clientèle*. A great English poet has said that those 'who love in age think youth is happy because it has a life to fill with love.' You and I are not so young that we can afford to waste the time before beginning to "fill our lives with love."

Gradually the old patients began to return, and the doctor had to limit the number of his new ones, in order to give himself time for his beloved hospital work. Among his friends came D'Hauteville, leaning on the arm of his wife. The brisk, hard energy about him had given place to a softened, touching languor. "I am shattered, Lavardin, somewhat shattered," he said, holding out friendly, though emaciated hands. "I want you to send us for our second honeymoon; our first, you know, was a signal failure—flashed in the pan, didn't it, dear?"

But his wife interrupted him. "I want you to do him as much good physically," she said, turning to the doctor, "as you once did me morally—you roused me out of my selfish lethargy, and from a spoilt child you have made a woman of me."

"And I have come to acknowledge to you, Lavardin, that the prizes of life are not worth striving for, if one sacrifices for them the welfare of those nearest and dearest to us; in our haste to be rich and to be foremost, we may sever the closest ties, and miss all restful happiness."

"Well," said Dr. Lavardin, looking over his spectacles, half-comically, half-solemnly, "my sentence of punishment to you both is—exile from Paris for the winter to the warm south, and after that" (turning to D'Hauteville) "resumption of your work in a modified degree. We all overwork at one time or another, and then we are apt to fly off at a tangent, and doom ourselves to the penalty of a life-long holiday; in the same way we make mistakes and suffer from misconceptions, deeming them, in our low estate, irretrievable—everlasting, whereas these faults and failings in our lives perhaps help us to a wiser knowledge of ourselves, and to a more perfect sympathy with our fellow-beings."

MARY CROSS.

EARS AND EYES.

THE laws and phenomena of nature have such an oneness in their diversity and are so exquisitely intertwined, that it is possible for us in the consideration of any new aid to a proper understanding of the world outside ourselves to help our conceptions by mental images derived from the older sciences or ordinary phenomena. This is especially true for that new eyesight, so to speak, with which the spectroscope has endowed us, an eyesight which enables us not only to revel in the beauties of distant universes, but in addition—

"To feel from world to world,"

and thus grasp the inner material essence as well as outward form.

It now and then happens in the history of the human race upon this planet, that one particular generation gathers a rich harvest of knowledge, this advancement generally coming from an exceeding small germ of thought.

Several such instances suggest themselves. How once a Dutchman experimenting with two spectacle-glasses produced the telescope; and how the field of the known and the knowable has been enlarged by the invention of that wonderful instrument. How once Sir Isaac Newton was in a garden and saw an apple fall; and how the germ of thought which was started in his mind by that simple incident fructified into the theory of universal gravitation. Each step of this kind has more firmly knit the universe together, has welded it into a more and more perfect whole, and has enhanced the marvellous beauty of its structure.

Future times will say that either this, or perhaps the next, generation, is as favoured a one as that which saw the invention of the telescope or the immortal discovery of Newton:

for as by the invention of the telescope the power of the eye was almost infinitely extended, so far as form was concerned; as from Newton's discovery we learned that like forces were acting in like manner everywhere; so in our time does the spectroscope, by enabling us to subject visual phenomena to a most searching analysis, reveal to the eye like matter acting in like manner everywhere.

I propose in the present paper to endeavour to state what this new language of light enables the eye to do, and to lead up to the new work of the Eye by referring to the action of the Ear, and even to other actions more familiar still.

We thus begin by elementary notions which, when fully comprehended, enable us to build on them conclusions which will be so many further steps.

By means of post-offices, railways, and electric telegraphs, we have the idea perpetually brought before us that in one place a man or a thing sends; that somewhere else, it may be near, or it may be far off, we have a man or a thing which receives; and that between the man or the thing which sends, and the man or the thing which receives, there is a something which enables the thing sent to pass from one place to the other. There does not seem to be any deep science in this, nor is there; but these considerations enable us to make an important distinction. In the case of two boys playing at ball, one boy throwing the ball to the other, we have also a sender and a receiver, and the thing sent goes bodily from the one who sends to the one who receives. So in a parcel sent by train, but *not* so in the case of a telegraphic message. In the electric telegraph office two instruments may be seen—

one the *receiving* instrument, the other the *sender*. Between the office in which we may be and the office with which communication is being made, there is a wire. We know that a thing is not sent bodily along that wire in the same way as the boy sends the ball to his fellow, or as the goods train carries the parcel. We have there in fact a condition of motion with which science at present is not absolutely familiar; but we picture what happens by supposing that we have a *state of things* which travels. The wire must be there to carry the message, and yet the wire does not carry the message in the same way as a train carries a parcel, or the air carries the ball.

Take another case. I burn my foot, I instantly raise it. To make me conscious that my foot had been burnt, a message (as we know now) must have gone from my foot to my brain, and a return message must have gone from my brain to my foot, to tell it to change its position so as not to be burnt any more. Now it is known that this internal transit of messages is not managed by electricity, but it is imagined that although electricity is not here at work, still that there is something which behaves very much after the manner of electricity. No one imagines that the *pain* travels up the leg and then back again; it is, in fact, a *state of things* which travels up from the nerve of the foot to the brain; and then there is another *state of things* which travels back again from the brain to the foot, along another set of nerves. A rope will here afford us a useful mental image. By shaking a rope we can send that *state of things* we call a wave along it without the rope itself travelling as a whole; this will help to give us an idea of what is meant when we say that a state of things travels along a wire or along a nerve and brings about either those electrical disturbances which result in the conveyance of a message, or that nerve action which generates the action of the brain.

Next to dwell more especially upon the word *wave*, and the idea which that word most generally calls forth. Let us find a piece of tranquil water and drop a stone into it. What happens? — a most beautiful thing, full of the most precious teachings. The place where the stone fell in is immediately surrounded by what we all recognise as a wave of water travelling outwards, and then another is generated, and then another, until at length an exquisite series of concentric waves is seen, all apparently travelling outwards—not with uncertain speed, but so regularly that all the waves all round are all parts of circles and of concentric circles.

Let us drop two stones in at some little distance apart. What happens then? We have two similar systems each working its way outwards, to all appearance independently of the other.

Now these appearances are as if there were an actual outpouring of water from the cavity made by the stone; but if we strew small pieces of paper or other light material on the water surface before we drop the stone, we find that it is not the water which moves outwards, but only the state of things—the wave. Each particle of water moves in a circular or elliptic path in a vertical plane lying along the direction of the wave, and so comes again to its original place. Hence it is that only the *phase* goes on.

Let us now pass to a disturbance of another kind, from two dimensions to three, from the surface of water to air, and consider the question of sound.

We hear the report of a gun or the screech of a railway whistle, or any other noise which strikes the ear. How comes it that the ear is struck? Certainly no one will imagine that the sound comes from the cannon or from the railway whistle like a mighty rush of air. If it came like a wind we should feel it as a wind, but as a matter of fact no rush of this kind is felt. It is clear, therefore, that we

do not get a bodily transmission, so to speak, as we get it in the case of the ball thrown from one boy to the other. We have a *state of things* passing from the sender of the sound to the receiver; the medium through which the sound passes being the air. A sounding body in the middle of a room, for instance, must send out shells of sound, as it were, in all directions, because people above, below, and all round it would hear the sound. Replace the stone by a tuning-fork. To one prong of this fasten a mirror, and on this mirror throw a powerful beam of light. When this tuning-fork is bowed, and a sound is heard, the light thrown by the attached mirror shows the fork to be vibrating, and when the tuning-fork is moved we get an appearance on the screen which reminds us of the rope, or we may use the fork in another way, and obtain a wavy record on a blackened cylinder.

Experiment shows that we have at one time a sphere of compression—that is to say, the air is packed closely together; and, again, a sphere of rarefaction, when the particles of air are torn further apart than they are in the other position. The *state of things*, then, that travels in the case of sound is a state of compression and rarefaction of the air. Hence the particle of air travels differently from the particle of water; it moves backwards and forwards in a straight line in the direction in which the sound is propagated.

This backward-and-forward movement results in the compressions and rarefactions to which reference has been made, in consequence of the impulse having been imparted to one molecule after the other. In consequence of the pendulum-like motion of the molecules their relative positions vary at each instant of time.

Each particle merely moves a little forwards and backwards, and always comes back again to its starting-point; but the condensations and rarefactions are gradually transmitted through the

whole series of air particles from one end to the other.

In dwelling upon sound phenomena, we have the advantage of dealing with things about which science says she does know something: from a consideration of these known facts we shall be able, slowly, but surely, to grasp some of the much less familiar phenomena with which the eye is especially concerned.

We all know that some sounds are what is termed high, and others low, a difference which in scientific language is expressed by saying that sounds have a difference in pitch. We know that the difference between a sound which is pitched high and a sound which is pitched low is simply this, that the pulses or waves, as we may call them for simplicity's sake, which go from the sender-forth of the sound (which may be a cannon, a piano, or anything else) to the receiver, which is generally the human ear, are of different lengths. What in physics is called a sound wave is constructed as follows: We have a line which represents the normal condition of the air through which the sound is to travel, and curves which represent to the eye—first, the relative amounts of compression (+) and rarefaction (–) brought about by the sound in the case of each pulse, and secondly the relationship of this to the actual length of the wave, or, what is the same thing, the time taken for the pulse to travel. Thus we may have long waves and short waves independently of the amount of compression or rarefaction, and much or little compression or rarefaction independently of the length of the wave. We know that the difference between a high note and a low note, whether of the voice or of a musical instrument, is, that the high note we can prove to be produced by a succession of *short* waves—such pulses as have been described—and the low note by a succession of *long* waves.

Now the loudness or softness of a note does not alter its pitch, that is,

it does not alter the length of its waves or the rate at which they travel. I can send a wave along a rope either violently or gently, but with the same tension of the rope we shall find that the length of the waves is about the same. Hence then the other idea added to the idea of pitch.

There is another point which is worth noting, although it is not needful to refer to it in any great detail, and that is that we know that sound travels with a certain velocity, and that this rate is subject to certain small variations owing to different causes.

We not only have to deal with amplitude, that is, the departure of the + and - parts of the curve from the line, and velocity, but we have this most important and very beautiful fact (for fact it is), which some will have observed for themselves. If a person in a room in which there is a piano presses down the pedal which removes the damper from the strings, and sings a note, the string of the piano tuned to that particular note will respond, and if he sing another note, then another string will reply, the first string being silent. If the experimenter were skilled enough to sing one by one all the notes to which the strings of the piano are tuned, all the strings would be set into vibration one by one, note for note. Nor is this all. Helmholtz has shown that the real *raison d'être* of articulate speech lies in the fact, first, that each vowel sound consists not only of a fundamental note, but of a varying addition of overtones, and, secondly, that our ears are so constructed that we can pick up these overtones as well as the fundamental in a whisper, as well as when we are listening to a full orchestra.

Hence if we sing the open vowel sounds, not only the fundamental but the overtones come back to us. The piano *speaks* so far as vocal chords can speak. The Italian *a* is especially rich. It is a very striking experiment to sing rapidly, *ah, o, ah, o,*

damping the string between each note. This fact may be explained in this way:—A piano wire, or similar sonorous body, which is constructed to do a certain thing—in this case to sound a particular note—always sounds that note when it is called upon in a *proper way* to do it. Now this is the point. The proper way may be either (1) that a particular vibration should fall upon it, or (2) that it should be set to work to generate that vibration in itself. If the piano wire only gives the same sound when struck either hard or soft, it is because it is manufactured to do one particular kind of work, and it can do no other.

Now we may pass from the piano back to the tuning-fork. We find that by using different quantities, or different shapes, of metal, these instruments give out different notes. If all be of the same metal, the different quantities of metal will give us a difference in the pitch. This demonstrates that the pitch of a note is independent of any particular quality of the substance set into vibration. Now although a great many musical instruments can sound the same note, yet the music, the *tone*, which one gets out of them is very different. That is, the pitch being the same, the quality of the note changes because the wave, or rather the system of waves, which we obtain is different. For instance, if we sound a note upon the violin, or the French horn, or the flute, or the clarinet, anybody who knows anything of music will tell which is in question, so that here we have, in addition to wave length and wave amplitude, another attribute, namely, that which in French is called "*timbre*," in German "*klangfarbe*," and in English, "*tone*" or "*quality*." This comes from variation in the overtones as in the case of the vocal sounds before referred to.

To sum up, then, what we have already stated with regard to sound. When we deal with the phenomena of sound, we find that they are composed

of disturbances or vibrations connecting the sender with the receiver; that the sound may vary in pitch; that the amount of the sound depends upon the amplitude; that the sound is independent of the material of the sender or the kind of disturbance, so far as pitch goes, but that, so far as timbre is concerned, it is to a certain extent dependent upon the nature of the material and of the kind of disturbance.

So much for the present about the phenomena on which the use of our ears depends.

We have now to consider that kind of disturbance to which we owe the sensation of light—light being to the eyes of the human race very much what sound is to the ears.

Again, for simplicity's sake, let us look at the question in the threefold point of view. Let us deal with the sender, the receiver, and the medium which connects the sender with the receiver; first observing that, so far as we know at present, not to go too much into detail, there are three kinds of receivers.

There is, first of all, that marvellous instrument, the human eye. There is next also a very marvellous thing, the photographic plate.

How is it that a few words will awaken in each one of us many memories of our childhood? Because we saw certain things in our childhood by means of our eyes; and the impressions which we received by means of our eyes were recorded in our brains, and we possess the faculty of being able to call them back—to *recollect* them—again. We have there a permanent method, so to speak, of recording things which are seen by the eye—of recording messages from a certain sort of sender. In the photographic plate we have also a permanent record of a certain condition of things—whether a face, a house, or a ship, or a particular state of the sea or sky; presented to a particular set of chemical conditions at some past time, which brings back

some pleasant remembrance of friends now perhaps far away. There we have two receivers which more or less accurately, and more or less permanently, record the disturbance which once impinged upon them.

Then besides the eye and the photographic plate, we have everything else in nature—the houses we live in, the furniture, the familiar faces around us, this page and everything else on the planet. And not only these, but everything in the Cosmos which does not shine by its own light. These form the third class of receivers—that is to say, those which do not record, at all events obviously, the impressions made upon them, and more or less perfectly reflect light, producing light echoes.

So much, therefore, for receivers of this kind of vibration. We must bear in mind that at night, or in a dark room, the things mentioned, and such like become invisible. Our eyes fail to see them, a fact which shows that the receiver plays a very important part. On the other hand, everything in a bright summer's day receives light from one light source—the sun. How is it, then, that with the first class of receiver, the eye, we are enabled, unless indeed we be colour-blind, to see all the beautiful and glorious varieties of nature in its ten-thousandfold hues; while the other receiver, the photographic plate, gives us but black and white? Why are roses red, and why are leaves green? There is the same light in the sky, and the same absence of form—the same absence of visibility—in the dark; yet, with the light coming from one and the same light-source, we get all these different effects. How is this? It drives us to the conclusion, either that the receivers, to which our attention has been particularly directed, deal with light in very different ways, or that by some means or other they manage to get hold of different kinds of light.

Here, then, we must seek for some explanation of the various colours that our eyes reveal to us. We have referred to the receivers, including those that

reflect the light which they receive; now, let us consider the things which send out the light. Among these are the sun, the moon, the stars, gas, and candles, which are most familiar to us as sending out light. And it will be well to remark here, and the reason why will be clear by and by, that the light which all these senders give to us is white light in the main. But we get other kinds of light.

We have, for instance, that of the electric arc—a very powerful source of light, only a very little less powerful (as some people think) than the sun itself. It proceeds from two carbon poles, which are rendered intensely incandescent by means of an electric current.

By inserting different metals between these poles, we find that we get light not only from the poles of the lamp itself (a source of white light), but that we obtain various-coloured phenomena by this addition.

It is not alone by means of the electric arc, or spark, that these phenomena can be produced. On putting salts of different metals into the flame of the Bunsen burner, we observe that the colour of the flame will depend upon the substances put into it. Sodium will give us a yellow flame, lithium will impart a certain redness to the flame, and thallium a green tinge. Now, if instead of dealing with metallic salts, we prefer to take certain gases, and render them brightly luminous or glowing, by means of the passage of an electric current, we shall in that case also get differently-coloured effects. Some of these gases are red, some are green, some are violet, and so on.

All these coloured phenomena of which we have spoken, are things which we can and do produce with chemical or physical instruments; but, in addition to those, we have various colour-giving bodies in the skies, in the same way as we have the sun, the moon, and those stars which are not brilliantly coloured. All who were fortunate enough to see

that beautiful comet which was visible in July, 1874, must have noticed that it was a yellow-looking comet—not so yellow as a sodium flame, but still distinctly yellow. Those who have had the opportunity of observing some of the stars through a telescope, or, what is nearly as good, those who have been across the Line and seen some of the stars of the Southern Hemisphere, know that some of the stars in the heavens are as beautiful, and, so to speak, as majestic for their colour, as others are for their brilliancy. Again, those who have seen a total solar eclipse, will have seen a large and interesting portion of the sun which we cannot see at any other time—a region of beautiful colours as well as of grotesque forms. So that we see that both in the heavens and on the earth we get instances of light which is white, and of light which is coloured.

So much for the senders. Now one word about the medium; for, as we shall understand, in the case of light, as in the case of electricity, about which we are uncertain, and as in the case of sound, about which we are absolutely certain; there is no transmission of anything but a state or a condition of things, a disturbance or a vibration, between the sender and the receiver. The light, for instance, which appears to be given out by a candle, and which is received by our eyes, does not come bodily from that candle, like so many small bullets, any more than bits of a sounding body impinge upon our ears. The sender—in this case the candle—is simply a something which puts something else into motion. And then there is a something which conveys that motion. By striking a bell and ringing it, a noise may be made; but if that bell is put into a glass vessel, and the air exhausted, and the bell is then rung, we do not hear it at all. How is this? Because the carrier of the sound waves is the air; and when we take the air away we take away all chance of getting

sound transmitted from one place to another. We know, for instance, that in our moon there is absolutely no sound. If the moon were teeming with life to-morrow, no one could hear another person speak. No sound, either loud or soft, could be heard by any inhabitant of the moon, because the moon practically has no atmosphere, even if she possesses one at all. Still, notwithstanding that there is no air all the way between us and the moon, or all the way between us and the sun, yet we get light from the moon and from the sun. How, then, is this?

Physicists imagine that there is a something which they call "ether," infinitely more attenuated than air, which pervades all nature and permeates all bodies; and that the disturbance or light wave produced by a light sender, or radiator, is transmitted along the ether very much in the same way as the sound state is transmitted along the air, or the state of motion is transmitted along a rope. Associated with this ether we have the undulatory theory of light, which supposes that everything which sends out light sets the ether—this subtle, imponderable air, so to speak—in vibration; and that those vibrations travel, without any transmission of the substance of the ether, from each sender of light to each receiver of light. Here we have one of the great triumphs of modern science, because, as many of us know, so great a man as Sir Isaac Newton started (and he was quite justified in so doing, with the facts at his disposal in his day) what was called the "corpuscular" theory of light, which supposed that little shots of light, so to speak, like little shots out of a cannon, were emitted from every sender out of light; in fact, that the ether carried light as a train carries a parcel, and not as a telegraphic wire carries a message. That, however, is not the opinion which men of science hold now. They have changed that opinion because their basis of facts has been

enlarged. Such must ever be the condition of science, and science can never be so flourishing as when she is changing her opinions, because her opinions can never be changed unless she has acquired a new truth.

Although, then, it is not generally supposed that there is anything in the nature of an atmosphere extending all the way between us and the sun, yet, because we see the sun, we suppose that there is some medium present, which medium has been named the ether. As there are ninety-one millions of miles, or so, between us and the sun, and ninety-one millions of miles multiplied millions of times between us and some of the stars that we can see, we are bound to imagine that this medium is almost, if not quite, perfect in its capacity for transmitting light, and does not make the light pay any appreciable toll on its passage. We know that our atmosphere is sometimes so constituted that sound travels along it with very great difficulty. This idea will enable us to appreciate the other—that light can have no great difficulty in travelling across the ether, seeing that it reaches us from stars immensely distant. We may, therefore, say that in the case of light we have ether as a general and almost perfect medium or transmitter of the disturbance produced by a radiating body to those various classes of receivers to which attention has been drawn.

How, then, are we to picture to ourselves the motions of the particles of ether in a light wave? We are already familiar with the circular orbits of the molecules of a water wave in a vertical plane in the direction of motion, and of the forward and backward motion of a particle of air in the direction of motion of a sound disturbance. The motion of the particles of ether, as imagined by modern physicists, is widely different.

In the first place, the motion is transverse to the path of the disturbance—that is, the vibrations take

place in planes perpendicular to the direction of the ray.

What, then, is the motion of the ethereal molecules in this plane? It varies, depending doubtless upon the vibration of the sender. The molecule may describe a straight path or an orbit—i.e., its path may be straight, circular, or elliptical—but in all cases the path or orbit lies in a plane at right angles to the direction of the ray.

A row of balls in a straight line may be taken to represent particles of ether at rest. If we imagine the balls to start successively, and vibrate uniformly up and down, we shall get a wave system finally established along the whole line; we shall have crests and hollows, and we at once get the same introduction of the ideas of wave length (the length from hollow to hollow, or crest to crest), and of amplitude, as we got in the case of the sound waves.

Here, then, we have one form in which the mutual attraction or elastic cohesion of the ethereal particles conveys a disturbance.

Now, in ordinary light, the paths and orbits are not all similarly situated. That is, the straight lines described by the particles may pass through the central line at different angles, and the major axes of the orbits of those which have elliptic paths may also cut the central line at different angles; so that, to quote Mr. Spottiswode,¹ "although there is reason to believe that in general the orbits of a considerable number of consecutive molecules may be similarly situated, yet in a finite portion of the ray there are a sufficient number of variations of situation to prevent any preponderance of average direction."

A word now as to the length of light waves, so that the scale on which the motions of the molecules of ether—our medium—take place may be compre-

hended. A comparison with the waves of sound will again bring out other similarities between the two classes of phenomena brought home to us by our ears and eyes.

First, then, with regard to sound. The average velocity with which a sound disturbance is propagated through the air is 1,140 feet in each second. It has been demonstrated by experiment that the lowest effective note we can appreciate as music is one in which the disturbances enter the ear at the rate of $16\frac{1}{2}$ per second.

Imagine then a column of air 1,140 feet long with sixteen compressions and rarefactions along its length. It is clear that this whole wave system must beat upon our ears each second, and that the length of the wave, i.e. the distance from maximum compression to maximum compression, or from minimum rarefaction to minimum rarefaction, must be nearly 70 feet.

The highest appreciable note, according to Helmholtz, is one with 38,000 vibrations per second.

Between these extreme limits, then, we have all the glorious world of musical sound which our ears are tuned to appreciate. The air is also teeming with sounds both below and above our range.

Now as regards light waves. As the ether is infinitely more subtle and more elastic than our grosser air, so are the disturbances propagated with a velocity which quite baffles our comprehension. The latest measurements tell us that a light disturbance travels at the rate of 186,000 miles in a second of time. Imagine the molecular agitation depending upon this statement, and then remember that a glowworm can set it all going, and that, when once in full swing, the distance of the most remote star is traversed as it were at a bound, and without sensible loss of energy.

Then as to the dimensions of the light disturbance. The length of the longest wave that we can appreciate is

¹ *Polarization of Light*. Nature Series (Macmillan).

·00076009 of a millimetre¹ (76,009 hundred-millionths of a millimetre, or about $\frac{1}{13000}$ of an inch). The length of the shortest is ·00039328 of a millimetre (39,328 hundred-millionths of a millimetre, or about $\frac{1}{25000}$ of an inch). The longest waves are red, the shortest violet. Now, as in 186,000 miles there are 298,000,000 metres, or 29,800,000,000,000,000 hundred-millionths of a millimetre, and as all the disturbances must enter the eye in a second, we have for the number of disturbances (or wave crests) per second

$$\frac{29,800,000,000,000,000}{76,009} = 392,000,000,000$$

that is 392 billions of disturbances entering our eye each second in the case of red light, and

$$\cdot \frac{29,800,000,000,000,000}{39,328} = 757,000,000,000$$

that is, 757 billions in the case of violet light.

We must next observe that light is not necessarily limited to transmission through the ether in free space. If a glass of port wine is held up to the sun, the light passes through it and seems red. In that case the light has had to pass through the ether *plus* the port wine, and there we can see that the new medium has made an enormous difference in the light which was originally sent us. Supposing the light from an electric lamp were thrown upon a screen, we should see that it is a white light, that is, the same kind of light as we obtain from the sun. Imagine that the light is really coming from the sun; by interposing a piece of blue or red glass (adding these substances to the ether, as it were), we at once alter the condition of things, and get a blue or a red light upon the screen. So it is clear, that if we want to study light phenomena completely, we must not only take into account the different circumstances connected with the sender and with

the receiver, but also the different circumstances connected with the medium through which the light passes, or, as we shall see by and by, with those media which *absorb* light; for, although we do not know that ether absorbs the light, yet practically we know that everything else does. We know the redness of the sun at evening arises, not from absorption by the ether, but from the absorption of the blue waves by the aqueous vapour in the air, through a great thickness of which the sunlight has to pass at that time, which practically does for the light of the sun what the piece of red glass did for the light of the electric arc in the experiment above suggested.

We see then, still dealing with our complicated medium (that is, ether + matter in some cases), that this association leads to an absorption of light, so that the receiver does not get all the disturbance set up by the sender, in consequence of the vibrations of the ether being used up by the molecules of the various bodies through which they have to pass.

This result is not the only one which follows from the entanglement, so to speak, of the ether waves among the molecules of matter. If the disturbance is travelling in such a direction that it passes into a substance denser than air—such as water or glass—at an angle, the direction of disturbance is changed, the wave, so to speak, has changed front, and the greater difference there is between the density of the two kinds of matter, such as air and water, or air and diamond, thus passed through, the greater will be this change of front, that is to say, the more will the direction in which the light travels be changed.

But the change of front is accompanied by something else which is very much more important for our present purpose, and this can be studied best when we make the disturbance enter and leave the denser molecules at the same angle.

¹ A millimetre is 0·03927 of an inch.

This can be accomplished by using in the first instance glass as an illustration of the material addition to the medium, and shaping it into the form of a prism. The effect observed was described by Kepler, and an explanation first afforded by Newton; but it has required the undulatory theory of light to render a complete understanding of it possible.

The addition of the molecules of glass, presented in the way referred to, to the ether disturbance, results (1) in turning the ray out of its course, and (2), if it be a ray of white light, in splitting it up into its constituents, each constituent being represented by a different colour, or (3) if the ray be of any special colour, in causing it to travel in a direction which is constant for the same colour, but different for each.

Glass affords us an instance in which the dispersion of colour thus obtained is *normal*, that is, the order of the colours obtained is as follows:—

Red, orange, yellow, green, blue, violet, indigo.

But there are substances the action of the molecules of which upon the ether is very different, and we get *abnormal dispersion* so called because the above order is changed.

The prism tells us that a beam of white light is, so to speak, not a simple thing, but that it may be likened to a rope with an infinite number of strands. If, for instance, by some concerted action all the keys of a piano are pressed down, a certain sound results, made up of a combination of all the sounds upon the keyboard. This then is the sound representative of a ray of white light. The reasoning which lies at the bottom of all the new researches which have made us as familiar with matter millions and millions of miles from us as we are with the matter around us, arises from the perfect establishment of the idea, that a ray of white light is universally composed of waves of light of various lengths, just as that clang upon the piano was

also composed of different true musical notes, that is to say, of waves of sound of various lengths, and that each light of special colour is composed of a single wave-length, or of a special combination of wave-lengths.

If, then, instead of letting the white light which we get from the sun or the electric lamp travel through a fine slit straight from the sender to the receiver, we insert a prism and lens in its path, we observe an effect of a complex nature; the light is thrown out of its course, and instead of the lens painting a single image of the slit through which it emerged, as it did before—instead of the image of the slit, which was white and small before—we shall have a rainbow-coloured image stretching across the screen. By adding a second prism to aid the action of the first, we get the same effect increased, as might be expected. That rainbow-coloured band is what in scientific language is called the spectrum.

Now, the difference between the blue light at one end of the beautifully coloured band, and the red at the other, is nothing more or less than a difference almost identical with the difference between a low note and a high note upon the piano. The reason why one end of the coloured band, which in future we shall call the spectrum, is red, and the other blue, is that in light as in sound we have a system of disturbances or waves; we have long waves and short waves, and what the low notes are to music the red waves are to light, and what the high notes are to music, the blue waves are to light.

There is a strict analogy between the world of sound and the world of light. Ears are tuned to hear different sounds—some people can hear much higher notes than others, and some people can hear much lower notes than others. In the same way some people can see colours to which other people are blind; indeed, the more we go into this matter, and the more complete we

make our inquiries, the more striking becomes the connection between these two classes of phenomena.

Hence it is that we can with advantage utilise the phenomena brought home to us by our ears as a sort of sub-soil plough, to enable us better to understand in what manner our eyes, perfectly trained, now enable us to cultivate fields which modern science has annexed to the region of the known—fields wonderfully rich in facts dealing not only with the action of the eye itself and the various qualities of matter, but with the physical bases of matter itself; with this beautiful and undreamt of expansion, that it is indifferent whether that matter is in the hand of the experimenter in his laboratory, or whether it is sending out light to us upon this earth from the very confines of the universe. Nature is so absolutely and universally true and regular in all that she does, and modern science is of itself such a slight regarder of time and space, that when it is a question of studying the smaller aggregations of matter, the spectroscope enables us to tell not only what kind of matter is at work, but it tells us a great deal, and will tell us a great deal more, about the actual conditions of that matter. Indeed, it is probable that in a few years we may know very much more about matter very far removed from our own planet than we do of a great deal of it on the very planet itself on which we dwell.

Let us assume that we are now prepared to take what we know about sound as representing, with more or less accuracy, some of the things that we know about light, and recapitulate the points which have already been touched on.

Both with regard to sound and light we may consider different substances, first as senders, then as receivers, and then as media. First, as to the senders with regard to sound—sound is set up or produced by bodies such as a tuning-fork, and we


know that sound is due to the vibrations or oscillations of that tuning-fork imparting a regular disturbance to the air; the sound which that or any other body produces depending upon the kind of disturbance which it sets up. With regard to light-sources, a body which gives out light does for light exactly what the tuning fork does for sound. A bell ringing is the equivalent of a fire burning or a star shining. Both with regard to sound and to light there are various kinds of receivers. We can, for instance, by preparing certain surfaces receive and place on record the shape and length of waves of sound—we can make a sound disturbance permanent. Photography provides a means of rendering light disturbances permanent. Here we have two receivers, one of sound, the other of light, which give a more or less permanent record.

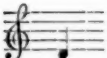
With regard to the medium—always to keep to our phraseology—we have the air, whose function it is to transmit waves of sound to our ears, and we have the ether to transmit the waves of light to our eyes.

We can imagine a compound sound composed of notes of all possible pitch; we have an exact equivalent of this in the case of white light, which gives us a continuous spectrum, that is, one in which from the red end to the blue or violet end there is no break in the light; like an army going into action, there are no vacant places in the line.

If we press down first one note of the piano and then another, we get an effect due not to a complete mixture of all possible sounds, but to each sound by itself. Now the new science of spectrum analysis, which has so enormously extended the field of observation open to our eyes, depends upon this, that what any one note of a piano which you choose to touch does for sound, each particle of matter does for light. Experiment has shown us that the "light-note," so to speak, given out by the sim-

plest particles of different kinds of matter, differs for each kind of matter. If we examine the spectrum of the light sent out by particles in a state of vapour, such as the vapour of sodium, for example, we shall have the equivalent of what we get when we strike a single note upon the piano. We have a spectrum composed principally of a very decided line in the yellow. It is very important that the connection between the yellow line and the single note of the piano, and between the continuous spectrum and the sound produced by sounding all the notes of the piano at once, should be perfectly understood. Suppose we now take a metal which gives us a line not in the yellow but in the green; the metal thallium. What, it may be asked, is the difference between the light being in the yellow and the light being in the green? The quality of the "light note" of thallium is different, so to speak, from the quality of the light

note of sodium, as  is different

from  and this is a dif-

ference (about which we know very little) which enables us to tell in a moment whether we have to do with sodium or thallium, when we make each vapour send out its light.

We have already got out two very different characteristics among our light senders. We have first of all, that light source which gives us a continuous spectrum, that is, a series of waves quite complete so far as the simple spectrum goes, and we have next that particular kind of light source which instead of giving us a continuous spectrum, affords us one with bright lines, that is to say, parts only of the complete spectrum are represented in the light, because parts only of a complete system of waves is given out. We get light which is only competent to give us a few

images of the slit instead of light which is competent to give us an unbroken series of such images. Here we deal with the giving out of light, or radiation phenomena.

We have already seen that the medium which a light disturbance employs to get to us is the ether, and the ether has no effect upon light except to transmit it; that if in the path of the light which is sent to us, and received by us, we place something else besides the ether, then we may to a very large extent destroy the qualities, so to speak, of the light disturbance.

By superadding the transmission through glass coloured red and blue, to the transmission through the ether, we get a distinct difference in the effect. In the red glass something is introduced in addition to the ether, which will only transmit red light; the blue glass transmits the blue and stops the red—and this is the reason why blue glass appears blue.

Here we are dealing with a class of experiments which provide us with what are termed absorption phenomena; that is, the differences are due not to the sender but to the medium, and the medium never adds, it always subtracts or, as it is termed, absorbs. If, instead of using coloured glasses, we take a solution of potassic permanganate—we shall observe certain dark bars across the spectrum, indicating that there is in Nature a class of bodies which have this very distinct effect upon the spectrum. Another experiment will enable us to get a much more definite effect. It will be recollected that sodium vapour was the vapour which, when added to the flame of the Bunsen burner, gave an intensely yellow light. Let us study the effect of using sodium vapour as the medium—not as a source of light but as an absorber. This we can do by sending the white light of the electric arc through some sodium vapour as well as the prism upon its way to the screen. In place of the bright yellow

line we saw before, we shall see a dark line upon the screen.

This experiment gives us an idea of a class of spectra of which we have very few natural representatives upon this earth, in consequence most probably of the complicated molecular conditions found in a cool planet—a class for which we have to search the skies, and which we can find in almost every star which shines on the face of heaven.

Here again an analogy drawn from sound will help us.

Suppose we have a long room and a fiddle at one end of it, and that between it and an observer at the other end of the room there is a screen of fiddles, all tuned like the solitary one. We know that in that case, as a matter of fact, the observer would scarcely hear the note produced upon any one of the open strings of that fiddle. Why? The reason is that the open strings of this fiddle, in unison with all the other fiddles, would set all the other open strings corresponding to it also vibrating, and upon the principle that you cannot eat your cake and have it too, the vibration of the fiddle cannot set all those strings vibrating, and still pass on to the other end of the room as if nothing had happened.

The work, in fact, which the air, the medium in this case, would have to do to make its vibration audible to the ear, would be locally done, so to speak, upon the screen of fiddles; the work done would decrease the amplitude of the vibration, and the effect on the ear would be weakened.

Now this, as Professors Stokes and Angström were the first to point out, is the real explanation of the result above mentioned.

Here we have a striking parallel instance of the fact that light phenomena are due to vibrations of light sources, communicated to us not by anything coming bodily from the light source, but by corresponding vibrations set up in the mysterious ether. If a sound wave travelling along the air

to the ear, or a light wave travelling along the ether to the eye, finds in its path a vibrating body which is ready to receive the vibration, *whether it be already vibrating sufficiently to give us the impression of sound or light or not*, that vibration is arrested or lessened, the sympathising body taking up the vibration in whole or in part.

Light-senders are really particles of bodies in vibration, and if there be no vibration, there will be no sending out of light. The reason why things such as gas, flames, candles, the sun, and other bodies send us out light is this, that they are in a state of energetic vibration—in that state which we generally call hot.

The hotter a thing is, or, in other words, the more energetic are its vibrations, the more complete, stable, and strong are the vibrations of the parts of which that thing is composed. The modern physicist tells us that the stones of which St. Paul's Cathedral is built consist of millions upon millions of small particles called molecules; and although St. Paul's Cathedral seems to be absolutely at rest, as if it would last for ever, and although each particular stone seems equally so, yet when we get down into the intimate structure of each stone, and of every part of the fabric, we get nothing but a multitudinous ocean of motion—that what appears to us solid, and at rest, is absolutely in a perpetual state of unrest; in fact, its stability consists in its state of unrest.

The difference between a source of light, such as a glowing solid or liquid, which, when analysed, gives us a continuous spectrum, and a gas or a vapour which does not give a continuous spectrum, and which does not therefore give us white light, is simply this, that in the case of gases and vapours which are produced by the atom-dissociating power of electricity and of heat, those molecules which give us those coloured phenomena differ only from the larger ones, which give us a

continuous spectrum, in that, owing to the action upon the one hand of electricity, and upon the other hand of heat, they are much simpler than the others.

As we melt a metal such as sodium, or even other metals of a very much more refractory nature; all of those metals which give us the beautiful rainbow band called the continuous spectrum to start with, come at last to a stage at which the spectra consist of one, two, four, eight, or more lines, as the case may be. But there are between those stages other intermediate spectra, which seem to show us that as the action of electricity or of heat is allowed to go on, those particles, whatever they may be, of which solids are built up, and which give us white light when we get solids or liquids to radiate, really become more and more simple, until at last we get that line spectrum to which reference has been made. Here the eye enables us to follow changes which are most difficult to detect in any other way.

In regard to elementary matter, we have first of all this fact, that if the particles under examination send us white light, we get a continuous spectrum from it; therefore when we have to deal with white light, we know that we are dealing with matter in a solid, or liquid, or densely gaseous state, but we do not know what matter it is; it may be any of the metals; it may be any of the compounds which will stand a high temperature; but whether it is bismuth, or oxygen, or nitrogen, or lime, we do not know. But when we have got the matter simplified, so that its particles, instead of being complex enough and self-contained enough to give us this white light, are broken up, and give us coloured light, then we find that no two substances with which we are acquainted give us the same sets of lines.

Hence the origin of the term *spectrum analysis*, as the study of the

spectrum thus enables us to tell one substance from another.

These coloured senders, these particles of matter otherwise called molecules, which send out coloured light, which, being analysed, gives us these lines, are really and truly things infinitely small beyond our conception, but yet absolutely and truly vibrating bodies, and the spectrum is the result of the vibrations.

That idea leads us further, and it enables us to say not only that such and such a spectrum is given by such and such a substance, but also that such and such a spectrum is given by that substance within a certain range of temperature, while other conditions are not without their influence.

Hence, with vapour as a sender out of light, we learn from the spectrum its quality, its density, roughly its temperature. The same vapour, when, instead of being used as a sender, is used as a medium, gives us exactly the same spectrum reversed, so that, to take an example, we can detect the presence of sodium vapour when it is sending out light, by means of its vibrations set in motion by heat, and when it is between us and any sender whatever which can feed it with those same vibrations; and we have in both cases the same means of determining that it is more or less of a certain temperature, and that its density is within certain limits.

It is by following out considerations of this kind that all the stars in heaven have revealed to us their constitution—that is to say, the elements of which they are built up, at what temperature they exist, and a great deal of their meteorology, by which term I mean the nature and extent of their atmospheres, and the way in which their atmospheres vary from cycle to cycle.

Here indeed we are in the presence of a new music of the spheres, to which our eyes are rapidly becoming attuned. As in the old one—

“Cycle on epicyle, orb on orb,”

are still the vibrating chords in the heavenly chorus; but the cycle is the cycle of the atom, and the orbs are no longer distant suns dwarfing our imaginations by their vastness, but the ultimate molecules of matter.

In this new world of the infinitely little as in that of the infinitely great, the eye is now beginning to read

the mysterious and enthralling hieroglyphs which are unfolded before it in the inner recesses of nature. My labour will not have been thrown away if I have proved that one way of getting into this inner temple is to enter its outer inclosure by the Portal of the Ear.

J. NORMAN LOCKYER.

GREEK MOTHER'S SONG.

I.

O where is peace in all the lovely land?
Since the world was, I see the fair and brave
Downward for ever fighting toward the grave.
A few white bones upon a lonely sand,
A rotting corpse beneath the meadow grass
That cannot hear the footsteps as they pass,
Memorial urns pressed by some foolish hand
Have been for all the goal of troublous fears.
Ah! breaking hearts and faint eyes dim with tears,
And momentary hopes by breezes fanned
To flame that fading ever falls again
And leaves but blacker night and deeper pain,
Have been the mould of life in every land.

II.

O is there rest beneath the meadow flowers?
Or is there peace indeed beside the shore
Of shadowy Acheron? nor any more
The weary rolling of the sickening hours
Will mark the interchange of woe and woe;
Nor ever voices railing to and fro
Break the sweet silence of those darksome bowers?
But there a sorrowful sweet harmony
Of timeless life in peaceful death shall be
In woodlands dim where never tempest lowers
Nor branding heat can pierce the sunless shade.
O sweet for ever in that dreamful glade,
If there indeed such deepest peace be ours!

SCHLIEMANN'S MYCENÆ.

It is a long time since any book has been more eagerly expected by historians and archaeologists than the complete record of Dr. Schliemann's work at Mycenæ. The main facts have long been familiar to the public through the columns of the *Times*, and through the published discussions of learned societies. But these were only foretastes of the fuller and more deliberate work which has now appeared, and which adds an all-important element hitherto almost completely withheld—I mean an adequate reproduction of the treasure by illustrations. We tire of a long description, and fail to grasp its details; but a picture brings the object before us in an instant. It is from this point of view that the present book will be found completely and thoroughly satisfactory. The beauty of the engravings, and the care with which they have been executed, exceed all praise, and this feature makes the work an epoch in archaeology, and gives it a solid value which nothing can destroy. Any careful inquirer will at once feel the faithfulness of the reproduction, wherever accurate reproduction was possible; and I can testify from a personal examination of the objects themselves at Athens last April, that in most of the cases (such as those of engraved rings) where the reproductions are indistinct, the originals were equally obscure. There is, moreover, a profusion of illustration which is quite beyond the limits of strict necessity, and betokens the large and liberal spirit with which the publication of the work has been conducted. It is but bare truth to assert that the English public owe a real debt of gratitude to Mr. Murray for this very splendid and costly undertaking.

The literary qualities of the work are by no means so high, if we except the ingenious and elegantly written preface with which Mr. Gladstone has introduced the work. Dr. Schliemann, as a mere observer, seems to me singularly unequal. Thus, in examining the lions on the gate of Mycenæ, he was the first to perceive, and, I think, rightly, that the faces of the lions had been riveted on, and were therefore of metal. Though many other travellers had seen them, they did not perceive this which now strikes me as certainly true. On the other hand, he describes this very piece of stone as the same hard breccia of which the rest of the gate is built. This is certainly wrong. At least, all other observers differ from him. Dodwell and Leake thought it basalt, others marble of some foreign kind; to me it appeared a grayish blue limestone of hard grain, and very smooth, but quite different from the adjoining blocks. Curtius quotes the French expedition to the same effect, and agrees with them. We have here, then, a very acute and a very careless observation combined concerning the same object.

It is of course not to be expected from a discoverer that he shall also be a logical or forcible writer, and perhaps many people will think that the mere reprinting of the chronicle of his work as it appeared in the *Times*, with trifling additions and explanations, is the best and most valuable record he can give us of his labours. But the subject must have gained greatly in interest and in clearness, if the author had rearranged his materials, and brought them into logical order. The very task of doing this would have excluded many repetitions and inconsistencies, and also such trivialities as the visits of the Emperor

of Brazil, which might be tolerable in a daily paper, but are unworthy of a permanent record. There is, moreover, one passage, at least, in reference to M. Stamatakes (p. 352), which betokens an amount of spleen very unworthy of the book, and which ought surely to have been rewritten.¹ Dr. Schliemann has accordingly not made the most of his great subject. It requires constant reference to the maps and plans to follow his involved descriptions. His historical inferences are hasty, and formed without any careful balancing of evidence. We also miss greatly a full and accurate index, in which the student would find a clue to the many details which are presented in the mere accidental order of their occurrence. More especially such important processes as *riveting* and *soldering*, or substances such as *linen* and *porcelain* find no place, or an accidental place, in the poor and hasty list which does duty for the index. In a book which retains the form of a journal, such a key is simply indispensable.

Yet is it not ungrateful to utter these criticisms upon the man who has done more than all the men of our day in furthering Greek archaeology? Let us rather thankfully accept the facts he has furnished, and endeavour to draw them together into some sort of unity. It will then remain to inquire whether we can venture any conclusions at all from their relations to our former knowledge upon the subject.

The historical notices of *Mycenæ*²

¹ If M. Stamatakes was really the responsible officer appointed to watch the explorations, and take charge of any treasures when found—if, in fact, as I understood at Athens, he was sent as a check on Dr. Schliemann, the passage to which I refer may be more easy to understand, but more difficult to characterise by its proper epithet.

² The limits of this article compel me to pass over in silence Dr. Schliemann's preliminary investigations at Tiryns, which are very interesting. It was likewise impossible to enter into any detail about the style and form of particular ornaments, of which the book exhibits a wonderful profusion.

are collected by Dr. Schliemann, and put together with the poetical allusions at the opening of his third chapter. I will here repeat them with such modifications as seem to me necessary to rectify the impression produced by his account.

The Homeric poems speak of the city as well situated, broad-streeted, and rich in gold—the latter epithet only being in any respect peculiar to it. It was the residence of Agamemnon, the leading king in Greece, who is recognised as the leader of the Trojan expedition. Nevertheless, this mighty king has his dominion even over the neighbouring plain curtailed by the power of Diomedes, King of Argos, whom Dr. Schliemann conveniently calls his vassal, but who, all through the *Iliad*, acts quite independently, and is a far more important hero throughout the larger portion of the poems. This indication of the rising power of Argos, whose antiquity is attested by massive cyclopean remains of the same kind as those of Mycenæ, is assumed as an acknowledged fact by the traditions of the Dorian invasion, for from that time on Argos is named as the main city of the district, and even lays claim to a primacy among the cities of the Peloponnesus. It was probably in connection with this transfer of power that the legends of the terrible domestic horrors in the family of the Atrides became popular, as it is always convenient to justify usurpation by the moral principle of a providential retribution of the crimes of deposed rulers. The Homeric poems only mention the murder of Agamemnon by his wife, and the revenge of Orestes. The Cyclic poets indulged in a long catalogue of murders and of incest, and this awful indictment against the fallen house of the Mycenaean kings became a favourite subject with the tragic poets of the fifth century B.C. at Athens.

But so completely had the city itself disappeared from the list of historical cities in Greece, that the poet Æschylus, writing a play about 457 B.C., in

which the central object upon the stage is the tomb of Agamemnon, actually places it at Argos, and completely ignores Mycenæ.¹ And yet, in the poet's youth, he had fought against the Persians, perhaps in company with people calling themselves Mycenæans, as is attested both by an extant inscription, and another copied by Pausanias. These documents at Delphi and at Olympia enumerated the cities which had joined the patriotic side in the great Persian war. The succeeding poets, Sophocles and Euripides, distinguish Argos and Mycenæ, and often mention the latter. But the opening scene of Sophocles's *Electra* contains so vague a picture of the Argive country, that the poet can hardly have had clear notions about it,² and though Euripides knew something of the cyclopean walls of Mycenæ, and mentions them so particularly, that Dr. Schliemann thinks he must have visited them, it is very remarkable that he never corrects or censures Æschylus's inaccuracy about Agamemnon's tomb, and throughout his *Orestes* confuses Argives and Mycenæans systematically.³

From this time onward the very name of Mycenæ disappears, though the site was for a time reoccupied, till the days of the geographers and historians of Roman times. Strabo shows by his absurd remark "that not a vestige of it remained," that he was writing at second-hand. Diodorus and Pausanias, on the contrary, give a definite account of its destruction by the Argives, which they agree in placing after the Persian wars in 468-4 B.C. They all assert that it was in their day—that is, in the first and second

centuries A.D.—a mere ruin. Pausanias, in describing the place, speaks of the subterranean treasure-houses of Atreus and his sons, one of which has been open since the beginning of the present century, and perhaps very much longer. Another has recently been explored by Mrs. Schliemann, and some in ruins still remain to be unearthed. Pausanias further speaks of the tombs of Atreus and of Agamemnon and his friends who were slain by Ægisthus. He apparently mentions four tombs—one of Atreus, one of Cassandra, which was disputed by the people of Amyclæ, one of Agamemnon, and one of his charioteer and Cassandra's two children, and of Electra (this last may have been a separate tomb); then outside the wall, tombs of Clytemnestra and of Ægisthus. But from the general character of Pausanias's book, I do not think we can at all infer that his enumeration was meant to be exhaustive. It has likewise been disputed whether the wall to which he alludes was the wall of the citadel or the wall of the town, nor does his text admit of this point being settled. But in one respect I think we may be positive. The tombs which he mentions were clearly tombs which he *actually saw*. He mentions them in the same breath with the treasures still extant. He specifies their relative position. He says that the Amycleans disputed the monument of Cassandra. Of course they could not have disputed about a mere tradition, when Pausanias says they disputed about a *monument*. Dr. Schliemann has proved that all the tombstones and tombs he discovered must have been hidden beneath the surface which Pausanias saw. He is therefore obliged to assume that Pausanias is speaking of a traditional site, and not of the actual monuments. This theory seems to me quite untenable.

Such being the whole of our historical evidence about Mycenæ, I will add, before leaving it, that I do not believe the evidence of either Diodorus or Pausanias, who lived many hundred years

¹ In his extant plays and fragments he never mentions Mycenæ—a remarkable fact.

² As a specimen of Dr. Schliemann's reasoning, I may mention that he supports the notion of Sophocles's ignorance of Mycenæ, but on the ground (p. 347) that the poet calls Agamemnon's tomb a *mound*, whereas he ought to have known that it was a deep grave! It is, indeed, hard on Sophocles to accuse him of ignorance because he did not anticipate Dr. Schliemann's theory!

³ For an example cf. vv. 97-103.

after the events, as to the date of the destruction of Mycenæ. I think they were misled by the name *Mukāris* on the Delphic tripod and on the pedestal at Olympia, and thought this to be conclusive evidence of its endurance up to that date. But I will show, in the forthcoming number of *Hermathena*, sufficient reasons from Pausanias's own words to conclude that this destruction by the Argives took place long before, and that Mycenæ was no Hellenic city in the days of Æschylus, who could not else have ignored it so remarkably in his play. Furthermore, I do not attach the smallest weight to the tradition repeated by Pausanias, about A.D. 170, that the tombs of Agamemnon and his party were at Mycenæ, and inside the walls, when I find Æschylus and his compeers completely ignorant of the fact—nay, even when the critical Euripides, who loves to note defects in Æschylus, and who may have seen the place, is ignorant of it. I take the report of Pausanias's cicerones, who told him this story, to be of the same value as that of the Egyptian cicerones, when they told Herodotus that the Great Pyramid was built by the shepherd Philitis. There were old tombs then visible. Nobody knew to whom they belonged; of course they were assigned to the most celebrated characters known in Greek literature as resident at Mycenæ. But if there be any legend in Pausanias which seems to me certainly late and artificial, it is this account of the Mycenaean tombs. The inferences which I have so far drawn are purely historical inferences, based on a critical survey of our Greek tests. I now proceed to inquire how far they are corroborated or refuted by Dr Schliemann's discoveries.

One monument at Mycenæ had attracted attention as early as the beginning of the present century. The treasure-house of Atreus, as it is commonly called after Pausanias, but "tomb of Agamemnon," as the modern inhabitants designated it—this remarkable subterranean chamber, which was

probably opened and rifled ages ago, was again investigated, apparently by Lord Elgin, before the year 1806. This is proved to demonstration by the description and drawings of the chamber, both exterior and interior, given by Dodwell,¹ whose travels did not extend beyond that year. He began to examine the antiquities of Greece in 1801, but does not specify at what part of his tour he visited Mycenæ. His account of the treasure-house is quite full and accurate, and it is indeed surprising that Dr. Schliemann should have given credence, in spite of this demonstration to the contrary, to the cock-and-bull story told him about Veli Pasha, and his excavation of the untouched sepulchre or monument in 1810 (pp. 49-51). Dodwell and Leake speak of "Lord Elgin's excavators" having found certain very interesting and archaic carved stones about the entrance, which the former reproduces, and which are very remarkable for their similarity in design to some of Dr. Schliemann's gold treasure, and still more to the carved fragments of marble found at the entrance of the second treasury excavated by Mrs. Schliemann.² Ernst Curtius also refers to Lord Elgin's excavations in his account of the building. I have not been able to ascertain any details as to Lord Elgin's work here, but fancied it could be made out from the collection of views and drawings which passed into the British

¹ There are equally accurate views of the treasury, both inside and outside, by Gell (*Argolis*), and a parallel description by Clarke, who visited the place about 1805, and who adds (*Travels*, vi. p. 492): "this chamber has evidently been opened since it was first constructed, and thereby its interior has been disclosed, but at what time this happened is quite uncertain—probably in a very remote age, from the appearance it now exhibits." Most unfortunately, Chandler, travelling some thirty years earlier, missed the place by accident on his way from Argos to Cleonæ. I can find no earlier account of the treasury, though it may be mentioned in some book I have overlooked. It would seem that Dr. Schliemann, though he refers to these books, has hardly any knowledge of them.

² Cf. the plates of these, p. 140.

Museum along with the Parthenon marbles. Dodwell, indeed, says expressly that one of the sculptured stones which he reproduces was then in the Museum. Mr. A. S. Murray now informs me that the evidence I had expected is not to be had in the Museum, and is therefore still buried in the unpublished journals of Lord Elgin.

The Greeks asserted that Veli Pasha found bodies covered with gold ornaments, as well as statues outside the mouth of the chamber. Discarding the latter statement, it seems odd that they should have invented the former fact altogether. I fancy it is either the report of a far older raid upon the chamber, or is derived from the rifling of some other ancient tomb where such things were really found.

But it is high time to turn to Dr. Schliemann's more splendid excavations. Led by his interpretation of Pausanias, that the tombs of Agamemnon and his friends were within the Acropolis,¹ he began to dig where the accumulated earth was deep, the bare rock within most of the area precluding any hope of old deposits. I will endeavour to summarize his discoveries, not in the order in which he attained them, but rather in the probable order of their antiquity.

At an average depth of nearly thirty feet below the present surface, he found, in chambers cut into the rock, five tombs, containing fifteen bodies of various ages and sexes, covered with all manner of arms, vessels, jewels, and rich gold ornaments, including six gold masks upon the faces, and several thin plates covering the breast, with indications of the face and figure worked upon them. Dr. Schliemann habitually speaks of these as *massive*, whereas they are really very thin plates, beaten very

fine, and of no great weight. In fact, the general impression produced by the treasure is that the men who made it wished to create the greatest possible display of the gold they possessed. There are, no doubt, both massive gold rings and massive jugs, but the general character of the treasure is such as I have described. My reasons for thinking these tombs far the oldest record found at Mycenæ is not only their depth, but the fact that they seem to have been, to some extent (perhaps altogether), ignored by the prehistoric Cyclopean builders of the large house south of the main group. For, in close connection with the foundations of this house, was found a sixth tomb, partly rifled by the builders of a Cyclopean water conduit, which led past it, and of which only a small but most precious corner was left for M. Stamatakes to discover. This tomb was only twenty-two feet under the soil, and yet was barely within the ken of these builders. The walls of the tomb are alleged by Dr. Schliemann (p. 352) to be far ruder than those of the Cyclopean house. Among all the other tombs, one body only in the first sepulchre had been rifled, but apparently by people digging without method or knowledge. Dr. Schliemann's account of the pottery found here is so brief (p. 295), that I cannot understand it; but he places the act of robbery in very ancient times.

At a distance of ten or twelve feet above this old and splendid group of sepulchres were found a group of skeletons, which had not been burnt, and various traces of possible stone coffins, and other evidences of tombs, which seem to have been less rich, and differently constructed. And here there seems to me some evidence in the scattered condition of the stones, and of various small gold and obsidian objects, that a considerable number of tombs may have been disturbed, which were originally over the older, and perhaps in no relation to them. People digging for treasure, when they came

¹ This inference, which is opposed, as he justly notes, to the opinions of many learned travellers, is not, as he implies, peculiar to himself. Dr. Clarke (*Travels*, vi. p. 494), in a learned argument, most of which is unsound, seems to hold the same view.

upon this shallower layer, would not think of hunting deeper, and so the safety of the deeper tombs was secured. Above these, possibly, later tombs, come a certain number of stone slabs, with very primitive carving upon several of them, and which Dr. Schliemann supposes to have been intended to mark the royal tombs far beneath.

There seem to have been twelve or fifteen of these tombstones at least. In some cases the unsculptured stones were found ten feet below the ornamented ones, in others they were on the same level; but Dr. Schliemann is so positive that they were all exactly over the five royal tombs, that he adopts the theory of their being renewed periodically, according as they became covered with the accumulation of years (p. 337). But if the place was an agora, with no building upon it, and with no other interments made in it, such an accumulation is inconceivable. It seems far more likely that the higher tombstone covered a later tomb, and that we have to do with an ancient necropolis, in which interments were made, at least occasionally, for centuries.

Apparently on a level with the highest and most elaborate of the tombstones,¹ which have very archaic war and hunting scenes carved upon them, such as the Assyrian kings delighted in, is a double circle of upright stone slabs, with transverse horizontal slabs joining them at the top by means of a carefully cut mortice. Dr. Schliemann tells us that these slabs, which were carefully set into the ground, and were loftier, according as the ground was lower, so as to keep the circle even, are all inclined slightly inward, so that a man sitting on them would find room for drawing in his feet.

I confess I was surprised when I first read this statement, for it did not agree with my own observations on the spot last April. It seemed to me

¹ Dr. Schliemann does not specify the depth of the stone circle below the surface, but I should guess it at about ten feet.

that only a few of the slabs were slanted, and this by the accidental pressure of accumulated *débris* against them. Many of them stood quite straight.² When Dr. Schliemann first describes them, he admits this (p. 117 note), and gives a special reason why, at the north side, the slabs must all be set perpendicularly. But when he has advanced to the theory of their being seats round the agora, he tells us (p. 124), "that it must be particularly observed that the whole arrangement of slabs slopes inwards at an angle of 75°." This appears to me a gradual and unconscious accommodation of the facts to his theory.

As I have already said, his theory is, according to Mr. Simpson's suggestion, that it was the agora of Mycenæ, and that this double row of slabs was set up to afford seats round it, upon which the elders or nobles used to sit. In corroboration of this, he quotes various ancient authorities on the circular seats, or circular form of ancient agoras,³ and assumes that Agamemnon and his friends were buried as heroes in this sacred public place of the city, according to a custom elsewhere observed in the case of founders of cities. This theory, that the agora of Mycenæ was in the Acropolis, seems confirmed by two passages in the *Iliad* (Æ, 788, η, 345), which he has noted (p. 339), and which speak of the Trojan agora as being at the door of Priam's palace. Then the large Cyclopean house, which he thinks the palace, is close beside the circle.

Nevertheless, I am convinced that this inclosure cannot possibly have been a Greek agora, and must have

² An independent observer, Mr. Simpson, who saw the site in March last, and who describes it in a very able article in *Fraser's Magazine* for last month, though he was the originator of the agora theory, does not mention the sloping of the slabs.

³ Some of the passages adduced, such as that of "Artemis sitting upon the famous circular throne of the agora," only prove that there were circular seats for gods in the agora, and, indeed, the triple figures of Hecate still extant at Athens and Argos actually stand upon a circular base.

been a sepulchral circle, such as those erected in Ireland and elsewhere by primitive people to mark the graves of their chiefs. All the passages about the circles of stones in Homeric agoras seem to show nothing in favour of the whole agora being circular and closed in, but rather that there was in every agora a sacred circle of stone seats on which the elders sat and judged. I take these stones to have been large, single blocks, such as those still at Athens in historical times, and called Jove's voting pebbles, and also *πῆσοι*.¹ The people, of course, crowded round outside this circle, which was kept clear by heralds, and in the middle of the vacant space lay the fine, or money at stake. Such I conceive an agora to have been.

But here we have the whole possible space inclosed with a complete double circle of slabs, so that there is only one way in. From the so-called royal palace, *there is no way for entrance*, so that the king would have been obliged to walk round to the opposite point of the circle, next to the gate. Is this conceivable? If the people did enter and occupy the agora, how could the elders sit round on the outer margin and debate across the crowd? Still worse, the crowd must have been standing upon and about sepulchres, and leaning on tombstones, upon spots where the charred remains show that sacrifices were frequently offered. To imagine that a protruding rock in the centre was a *bema* or platform for the orators, is to make confusion worse confounded, for, so far as I know, the custom of speaking from a *bema* is completely foreign to heroic times, when chiefs rise in turn from their seats, and speak, as it were, in council from their places, not addressing the crowd, though heard and applauded by it. Dr. Schliemann actually cites passages to prove the existence of the *bema*, which have

nothing whatever to say to it, except so far as they prove its absence (cf. p. 125 and notes). To me such suppositions seem absolutely untenable. We have a few exceptional cases of public benefactors, such as Brasidas, being publicly buried close by the agora. The Greek expression is generally either *before* or *at the end of* the agora. But there is evidence that such tombs were specially inclosed with a *θηγκός* or fence, and hallowed by sacrifices, nor did people ever walk about over them. I see, therefore, the most insuperable objections to this theory, and everything to support the notion of its being a sacred sepulchral inclosure. We know that in historical times there was a strict law against burials within the walls, but this very prohibition points to an older custom, mentioned by Plato and others, of burying the dead in the city and close by the ordinary dwelling-houses. We find that in or about this inclosure a considerable number of bodies have been laid. We find its soil very much disturbed, as if it had constantly been dug and replaced. We find no traces of any houses within it. We even find foreign earth brought to it to fill the tombs.

All these facts, brought to light by Dr. Schliemann, seem to point to the necessity of some different explanation than his. It seems not impossible that, when the Argives destroyed Mycenæ—probably in the days of Pheidon, or even earlier—they may have thought it necessary to maintain religious offerings and other observances on a site long since hallowed, and regarded as the resting-place of heroes. If so, when they partly pulled down the wall, and dismantled the city, they might have erected this carefully-built, but not very substantial, fence, and left some family in charge of the sacred rites. Such a proceeding would be in accordance with Greek feeling, if all the heroes of Mycenæ could not be transferred to Argos. But what is here ventured is of course mere conjecture, and only

¹ Cf. *Ἐνθα Διὸς μεγάλοι θῆκοι, πῆσοι τε καλοῦνται* (Cratinus), also—*πῆσσους προσελθὼν ἔνθα δὴ παλαίτατοι θέσσουσιν* (Euripides, *Medea*), and the *Lexica en Διὸς ψήφος*.

intended for a counter conjecture to what the author proposes, somewhat too confidently, in his book.

There are, indeed, such colossal difficulties in the way of any theory, that it would be safer and more modest to press no suggestions, but merely state fully and clearly the puzzles, and let them wait for their solution. Here are some of them:—(1) The manner of burial of the royal personages is quite foreign to the Homeric descriptions, and in some respects foreign to anything we have yet found. There are, indeed, cases of gold masks even in Peru, according to Mr. Squier. But there is no case of such lavish use of them along with breast-plates of gold, except, perhaps, in the tombs found at Kertch and Alexandropol, which were even more profuse in large plates of gold. I did not consider the Mycenaean masks, when I examined them, to be in any sense personal likenesses, but conventional faces prepared beforehand, and kept ready for the occasion. But the laying of the bodies into a deep rocky chamber below the level of the earth, the packing of them into a compressed bed in threes and fives, and the piling in of earth and pebbles on splendid treasures—these things are, indeed, passing strange. Both Mr. Gladstone and Dr. Schliemann think this crushing of the bodies into a close space¹ a sign of hurry or ignominy, but I would remind them that the large rocky chambers were filled in with care by artificial walls, so that this arrangement must have either been prepared beforehand by the builders of the tomb, or, if done at

¹ I used to think that the bodies originally lay higher in the tombs, with some wooden structure under them, and that the artificial narrowing at the bottom of the tombs was for the purpose of making a better fire under the bodies, which were lying at full length above it. With the burning of the fire the bodies would sink down, and then the weight of material lying over them would crush them into the narrow bottom. But Mr. A. S. Murray has lately shown in the *Academy*, that in the Hallstadt tombs bodies seem deliberately crushed into narrow beds.

the time of the funeral, required additional labour and time, thus directly contradicting their hypothesis. This building in of the walls of the chambers was therefore undoubtedly part of an established system of burial, and the evidence goes to show that all the bodies were entombed with great pomp and circumstance—in fact, in a manner the very reverse of the legendary burial of Agamemnon. Besides, the Homeric heroes were buried on the level earth, and mounds raised over them; nor might the shrewdness of Homeric sentiment have tolerated such an expenditure of gold, had they even possessed it.

Again, if the so-called treasuries at Mycenæ are tombs—a theory which I am disposed to accept—we have the curious contrast of an immense chamber, and even two chambers, being allotted to a king, into which access was preserved by means of its giant portal. If this be so, these great chambers are the work of a different age, or of a different sort of men, from the tomb-builders in the Acropolis. It is a great pity that Dr. Schliemann did not give us accurate drawings of the bodies *in situ*, and how they exactly lay in the tombs,² for I do not think he offers any satisfactory proof that they were burnt *simultaneously*, even in each tomb. He says (p. 336), "*Owing to the enormous depths of these sepulchres, and the close proximity of the bodies, &c., separate interments in each*

² A writer in last month's *Blackwood*, apparently under the guidance of *Signor Stamatides*, as he calls him, not only speaks of the caldrons and weapons having been laid in a fixed order beside the bodies, but even of "a complete case [of gold] for the tender limbs of an infant, which lay folded in the embrace of its mother." This latter is not mentioned in the book before us, I did not see it in the bank at Athens, and it is possibly an exaggerated account of the small child's mask (p. 199). But the hint of some order in the laying of the ornaments is very important, and points, I fear, to such enthusiastic haste in the first moving of them, as to destroy valuable evidence concerning the exact nature of the burial.

tomb must be impossible." But in another place he tells us that he found a tombstone only $3\frac{1}{2}$ feet above the tomb; there is much probability of a gradual accumulation, and I am convinced that when the bodies were laid there, the tombs (as the possibility of burning in them proves) were close to the surface. Moreover, as to the proximity of the bodies, we are distinctly told that there were "separate funeral piles" (p. 155).

The reader's attention should be called to the important fact that the size of each tomb is in direct proportion to the number of bodies interred in it.¹ The smallest (11 ft. 6 in. by 9 ft. 8 in.) has one body. Three of somewhat the same size ($21\frac{1}{2}$ ft. by $11\frac{1}{2}$ ft.) have three bodies each, except that the one which contains women's bodies is smaller than the others (16 ft. 8 in. by 10 ft. 2 in.). The largest (24 ft. by $18\frac{1}{2}$ ft.) has its much greater breadth occupied by five bodies, of which two are at right angles with the other three, and thus lie exceptionally north and south.² The other bodies all lie *across* the length of the tombs. These facts prove to demonstration that either the tombs were specially hewn out for a fixed number of bodies—which makes all hurry out of the question—or that the bodies were distributed so as to fill previously constructed tombs. In the latter case a gradual filling of them is infinitely more probable than a series of deaths of great people in opportune groups.

(2.) As to the *antiquity* of the tombs, no man pretending to any insight can doubt their being very old; and the whispers I heard at the Society of Antiquaries last spring about a

possible Frankish origin are completely silenced. It is far more likely that their age is still underrated, and that they date from a period long anterior to what is called the Homeric epoch.³ This is plain if we consider that an accumulation of twenty-five feet of soil separates them from the surface of Mycenæ when it was destroyed by the Argives, and that the sculptures upon this latter surface—the latest work of old Mycenæ⁴ are so rude and archaic as to be fairly called still prehistoric. The strangest fact about them seems to be their want of advance upon the oldest work deep beneath. Even the very walls built close to the circle of slabs are mostly poor and wretched, made of little stones and badly fitted, so that we ask in wonder, Can the builders of such walls be the same as the great Cyclopean masons of the circuit walls, and of the treasury of Atreus?

But if the remains on the surface of old Mycenæ are rude and primitive, the products of the tombs are in many respects most beautiful and highly finished. There is work in these tombs, such as the bull's head (p. 215), the alabaster vase (p. 246, which is far more beautiful than appears in the woodcut), the jugs and bracelets reproduced all through the book, which would be thought very perfect at any epoch. But this is not all. Among the *processes* used are frequently soldering,⁵ plating,

¹ This view is favoured by the writer of the interesting article in *Blackwood*, to which I have already referred. He seems also to have abandoned the prevalent theory about the agora, to judge from his silence on the point.

² Dr. Schliemann was the first to discover that the site was reoccupied in the Macedonian times, but evidently for no very long period. The remains of this later occupation, which lie near the surface, are quite distinct from the remains of the older city.

³ The index, which is very poor, does not give this head at all. The reader will find examples on pp. 164, 194, 206, 227, 231, 236, 251, 280. The plates accompanying the descriptions make it certain that the process was used, along with the older and simpler riveting, which is often applied as an ornament on the various objects.

¹ This shows the value of Dr. Schliemann's remark (p. 345), that "the graves were mere deep, irregular, quadrangular holes, into which the royal victims were huddled by three, and even by five!" Not to speak of the extraordinary plenty of "royal victims," nothing could be more orderly than the laying of them in their tombs.

² In the Scythian tombs slaves seem to have been laid across the feet of their masters.

and even the incrusting of gold with crystal. Among the *substances* are fine woven linen, porcelain, glass, alabaster, amber, ivory, and even ostrich-eggs! How are we to account for the perfection of the oldest, and the rudeness of the latest remains of Mycenæ? Apparently by two hypotheses, both of which I put forward with no great confidence.

In the first place the old city was destroyed, not in 468 B.C., as Diodorus and Pausanias tell us, but some centuries earlier, so that the latest inhabitants would still be in the most archaic condition as to the arts they practised, hardly in fact more advanced than the Homeric age. On the other hand, the beauty of the execution and variety of material in the older tombs are only to be explained by a very ancient and lively transmarine commerce, especially with Egypt. We underrate the communications among prehistoric peoples. We forget that Egypt, long before this period, was in no "prehistoric" condition, but the mother of arts and sciences, and teeming with manufactures. Though the index is almost silent about it, any careful reader of Dr. Schliemann's book will notice how perpetually he resorts to Egyptian analogies. I fancy there is a great deal more of the treasure imported than is usually imagined, and that as soon as this commerce decayed, the native artists and handicraftsmen found themselves very helpless, and rather fell back than developed in their skill. Thus there is no improvement in the manufacture of glass. With the bodies are found glass objects with tubes one within the other, and also coloured. These were, I suppose, imported from Egypt. In the later strata there are not even found the glass bottles common elsewhere. In fact the native manufacture of glass was never practised there, and so it is with many other objects. With the exception of a single inscription,¹ I cannot find one

¹ The iron keys, figured on p. 74, strike Dr. Schliemann as late, and may perhaps have

object in the whole book which compels us to refer it to Greeks of the opening of the fifth century B.C. Nay, rather the absence of what such people ought to have left is a demonstration of my first hypothesis. The very archaic nature of the pottery found on the highest level of the old Mycenæ seems to corroborate it.

(3.) The *artistic character* of the various ornaments is no less a subject for discussion and doubt. If, as I hold, a large portion of it was imported from abroad, possibly from Egypt, why is it that we cannot trace this foreign element more distinctly in the type and style of the ornaments? An attentive observer cannot study the treasures of the Palestine tomb now in the Collegio Romano at Rome, without being struck by the Phœnician or Phœnico-Egyptian style of the work, and their foreign origin seems at once stamped upon these remains. But we are here in a much later epoch, and a Phœnician inscription on one of the vessels gives us a kind of evidence wholly missing in the vastly more ancient treasures of Mycenæ. Nevertheless there are not wanting a few strange parallels. Dr. Schliemann mentions (p. 332) too briefly a small wooden box, upon which, he says, were carved in relief a lion and a dog. This box appeared to me, on careful examination, to have been bound round the sides with thin plates of silver cut square, and the little animals, of which two dogs were very plain, seemed to me not carved in relief upon it, but stuck on it. In the Palestine treasure there is a closely similar box, with wooden animals riveted on, I think, to the sides in the same way. But there are no rivets visible on the Mycenæ box. I take both

strayed down to the place in which he found them, in Macedonian days. He unfortunately does not mention the depth at which they were found; the very case in which such detail would have been most important. The inscription is exactly such as might be derived from the cult of the old heroes of the city after it had been otherwise abandoned.

objects to have been the work of the same school of art.

Again, Mr. Newton has pointed out that the vases are to be matched in style and execution with those of an ancient tomb at Ialysos; and now we hear that the ornaments at Spata are very similar. An ornament in the third tomb, marked μ , 46, representing a female face surrounded with leaves, appeared to me thoroughly Egyptian, and I am very sorry the directors of the Bank would not allow me to note down its peculiarities at the time.¹ But after making all allowances, after discounting the alabaster, the ivory, the ostrich egg, the blue glass, and even such perfect work as the great bull's head in gold and silver, there still remains a vast quantity of cups, jugs, buttons, and caldrons, which seem to have a peculiar stamp, and which, from the likeness they bear to early Greek work, strike us as being plainly its direct progenitor. Thus the splendid vase, No. 213, which has a row of armed warriors upon it, is essentially an old Hellenic vase in character. Even the extraordinary signet-rings and engraved gems which would certainly seem imported, have a character quite peculiar, and which, I fancy, is not easily to be matched in other ancient treasure. Yet if I am right about the very great antiquity of the tombs, and if the legends which bring the house of Pelops from Asia are to be believed, there may have been models for all this work in the old civilizations of Asia Minor which are now lost.

(4.) Perhaps the most salient feature in all the treasure, regarded as a whole, is the rich and varied use of *spiral ornamentation*. Any one acquainted with the old Irish gold work, or illuminated manuscripts, is astonished to find that what was regarded a pecu-

liarity of Celtic ornamentation reappears as the strongest characteristic of this pre-historic Greek work. The likenesses between the Mycenaean and Irish spirals are not actual sameness of pattern, for I compared them by means of the catalogue of the Irish Academy, which I carried with me. There seemed only one ring in both collections made on the same pattern, and if there are other exact coincidences they are but few. Nevertheless, the general character of the ornaments, the beating out of fine gold plates for diadems, and then decorating them with *repoussé* patterns, the use of riveting for ornament, the scarcity of soldering, the general aim of making the greatest display with a small quantity of gold—all these things afford striking analogies. If Dr. Schliemann had examined early Irish ornamentation he need not have been astonished (p. 85) at the contrast between the accuracy and symmetry of the patterns, and the rudeness of the figures on the Mycenaean tombstones. This very contrast is, in a far higher degree, the characteristic of the famous *Book of Kells*, in the library of Trinity College, Dublin.

But it does not seem that any inference can be drawn from all this, except that primitive people—perhaps primitive Aryan people—will develop the same sort of ornament under similar conditions. It would, however, be surprising if any special kind of ornamenting were really proved Aryan. I may add that, though Dr. Schliemann perpetually talks of the *svastika*—a cross with bent ends—being the pattern introduced in the Mycenaean ornaments, I cannot find a single honest specimen of it in any of the engravings through the book.

(5.) But what was the relation of the great builders of the cone-shaped chambers to the builders of the tombs in the Acropolis? This seems to me really the greatest of all the puzzles presented by Mycenæ. In the so-called treasuries we have great solid roomy chambers, built with

¹ The strictness with which the Greek officials, who were most courteous, forbade the taking of notes or sketches when visiting and handling the treasure, proved a serious obstacle to any accurate or minute criticism of the multitude of objects exhibited together.

splendid and colossal masonry, apparently as resting-places for the dead. Within the Acropolis, and within a circuit of similar great masonry, though in some places ruder, we have the dead, with all their jewels, buried in small rock coffins, with layers of pebbles and earth covering them. There seems no trace whatever of a passage into the tombs through the Cyclopean wall on their west side, though the rapid fall of the hill would have made it not difficult. But Dr. Schliemann has so hidden the great Cyclopean wall here by throwing over his rubbish, that all inquiry into such a solution is at present impossible.

Assuming all his descriptions to be accurate, and these tombs to be really mere holes in the ground, how can the same people have built the House of Atreus? Let me add, what Dr. Schliemann has kept out of sight all through his book, that the walls he unearthed round the stone circle are mostly miserably built, with ill-fitting small stones—so bad as to look like Turkish walls, and that the *θηρικός*, or inclosure of slabs, is itself flimsy and poor enough—in fact, as Mr. Simpson suggests, a mere imitation in stone of a wooden fence. Though I have heard Mr. Newton make light of this contrast, and say that the same people might build massive walls and mere temporary partitions, I cannot but think so great a difference in execution, especially in so sacred a place, is an important fact, and I know that Ernst Curtius thought so when we talked over the matter at Athens.

If, then, these contrasts indeed separate the Mycenaean tombs into two distinct classes, what is their relation? Mr. Newton is said by Dr. Schliemann to think the treasures the older. With the greatest diffidence I venture to suggest the reverse theory, and that the tombs in the Acropolis, with all their gold, their imported manufactures, and their barbaric splendour, are the work of an older and richer race, which had developed personal ornament, but which had not learned to build with the skill and power which

belongs to the Cyclopean builders. If, as Mr. Simpson holds, this sort of massive building, which extends only over the N.W. Mediterranean, was the result of special teaching by a special race of builders, we can imagine them coming to Mycenæ after its kings had become powerful by wealth and known by commerce. We can imagine them teaching a newer and more splendid way of entombing the dead, in which the rich jewels and offerings should not be hidden and crushed, but safely preserved in a spacious tomb. We can imagine them rebuilding the Acropolis wall and gates, and making Mycenæ indeed a "well-built city." But if the Acropolis had already been such a fortress as it then became, it is inexplicable how such a building as the house of Atreus, whether it be a treasury or a tomb, should have been built outside the fortification. But I find myself supporting conclusions instead of abiding by my intention of merely stating problems.

The practical issue of all the remarks I have hazarded upon the splendid book before us is this: We must lay aside all the theories contained in it, we must submit all the Greek texts quoted at random to a critical revision, and see how many of them bear on the question. We must further insist upon the accurate establishing of each fact by itself, and not in relation to some enthusiastic hypothesis. When all the literary materials are thus sifted, men of long experience in archaeology may proceed, by the light of the admirable illustrations in the book, to find out, through comparison and analogy, the parentage and the probable age of this early and barbaric, but yet elaborate and advanced, handiwork.

Whatever the result may be, future generations can never forget the labours and the successes of Dr. Schliemann. There are many merchants in England with far larger fortunes than his, and yet which of them is inspired with the idea of applying his wealth to so noble

and instructive a field of discovery? How few men there are, too, who would work away, in spite of detraction and enmity, and labour to obtain knowledge, or, it may be, treasure, which ceases to be his own as soon as he has found it, and passes by law into the museums of the Greek nation? And now there will be added to his trials the sceptical doubts and the refutations of scholars, who sit at home and view, through the microscope of criticism, his bold and poetical theories! It is not, therefore, without some compunctions that I feel the tone of the foregoing article may be called unsympathetic, and perhaps wanting in respect for so unique and brilliant an excavator. Most of the objections, however, will be found to lie, not against Dr. Schliemann's genius and industry, but against the theories which his wonderful and sudden discoveries induced him to adopt. In the interests of truth he will pardon me for submitting these theories to an adverse criticism; perhaps my objections may even lead him to establish them on better evidence.

It will appear from like considera-

tions why I have not devoted to Mr. Gladstone's brilliant preface an adequate share of this review. Mr. Gladstone reasons upon Dr. Schliemann's premises, and, assuming that the tomb is that of the Homeric Agamemnon, he proceeds to show that its circumstances, and the nature of its ornamentation, are not contradictory to the inferences which may be drawn from the text of Homer. Though fully appreciating the ingenuity of Mr. Gladstone's reasoning, and the eloquence of his exposition, I am as yet totally unable to see any probability in the identifying of any of the bodies with that of a Homeric Agamemnon; and until this difficulty be overcome, it seems premature to enter into the sifting of the details which Mr. Gladstone has gathered together with his usual learning, and proposed, with great diffidence and modesty, to support a merely conjectural theory. Nevertheless, the preface adds a most agreeable and valuable chapter, and his name will lend additional dignity and importance to a book which must be regarded as marking an epoch in the study of antiquity.

J. P. MAHAFFY.

DULCISSIMA! DILECTISSIMA!

A PASSAGE IN THE LIFE OF AN ANTIQUARY.

"COME, my dears," said I, looking in upon the room where my children were engaged in their various avocations; "come and see what a very interesting acquisition I have got to my collection of antiquities. It is the remains of a little Roman girl just discovered close to the place where the foundations of the Roman villa were turned up last summer; and it seems very probable that this little girl was a daughter of the house. Here is the glass jar—a more elegant and beautiful one than I have ever before seen used for the purpose—which contains her ashes; here is the lamp to light her on her last dark journey; here are the little ornaments she used to wear—mark especially this exquisitely enamelled *fibula*; here are her little shoes all quaintly studded with brass nails."

"O what funny shoes!" exclaimed one; "there must have been very bad roads in those days, when even little girls wore shoes studded with nails like that."

"On the contrary," said I, "the Romans were the first road-makers in the world; but never mind that now, here is the stone tablet which records her history, and a very interesting one it is."

D M
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VIX. ANN. VI.

"The letters D M at the top stand for *Diis Manibus*, something like," said I, with a free translation suited to family comprehension, "our 'Sacred to the Memory of.' The inscription then reads thus: 'Sacred to the memory of Lucia Metella, a little daughter most sweet, most tenderly beloved. She lived six years.' Observe that the Romans always, as Dr. Bruce

remarks, avoided the mention of death; they tell us how long a person lived, never when he died. But is it not interesting," I went on, "to find more than a thousand years ago, and among a stern and warlike people like the Romans, these little touches of family tenderness and love?"

"O how very interesting! What a charming acquisition! How excited Dr. Harris (Dr. Harris was the antiquary of the district next in repute to myself) will be when he sees it!" were the various parting remarks made by my auditors, as they scampered back to their ordinary employments.

All but one. My Lily, my youngest, the apple of my eye, still stood, her fair head resting on her slender arms, gazing in silence, her lips slightly parted, a tear trembling in each soft blue eye, upon the relics of the little Roman girl. At last she spoke—

"Papa," she said, "this little girl was just the same age that I am."

"Yes, my darling," I said, "that is so; and moreover," I added, as a playful diversion to the child's gloom, "both your names begin with L—another coincidence."

But the thought that was in the child's heart was too deep for playfulness. After a pause she spoke again in pleading tones—

"Dear papa," she said, "it seems so pitiful for this poor little girl to lie here among all these queer things."

"My darling," said I, "these queer things, as you call them, are Roman things, such as this little girl was accustomed to see around her every day during her lifetime. Indeed, many of them came from the villa of which it seems very probable that she was the daughter."

"But dear papa," she said, "you

would not like *me*, when I am gone, to be laid out like a curiosity, and have strangers come and examine the little things I used to be fond of, and remark what funny shoes I had."

"Well—but, my dear child," said I, "what would you do with her?"

"I would bury her," she said, with childish seriousness, "in the garden, beneath the weeping ash, where good old Cato and my dear little dicky and Willy's white rabbit are buried. And—and," she added, in a lower voice, "I would add upon the stone, if there is room, 'Suffer little children to come unto me.'"

"My darling," I said, "I think all that would be a little incongruous; but I'll tell you what we might do," I went on, as a device occurred to me, which I thought might soothe the feelings of the child, "you shall gather from time to time fresh flowers to lay upon her as she lies, and then, if her poor little spirit can look down upon this world, she will see that, though a thousand years have passed, one dear little English girl still watches over her with tenderness and love."

"O yes," she said, brightening at the idea, "I think she would like that. I will gather fresh snowdrops for her now, and then when summer comes again I will change them for violets."

"*When summer comes again!*" A sudden pang of foreboding shot through my heart as the dear child spoke. She too was most sweet—she too was most tenderly beloved. But we were not without our fears on her account, and anxious whispers had passed between my wife and myself respecting her. But I cast aside the fears, as presently she returned, eager in her little work of love, with the snowdrops she had gathered, and, sitting down by my side as I was engaged in making out the maker's name upon the vase, she wove them with deft fingers into a pretty wreath, which done, she reverently laid it in its place, and hand-in-hand we left the room together.

The next morning after breakfast I had a considerable amount of congenial

work to do. In the first place there was a full and detailed account of these interesting discoveries for the County Society of which I was President, then a more condensed report for the Society of Antiquaries, of which I was a Fellow, various questions of detail had to be examined and elucidated, and in the course of the morning an artist was to come up to take photographs of all these rare and beautiful objects. While I was thus engaged my wife entered the room with a troubled countenance.

"I am very uneasy," she said, "about dear Lily; she talks in such a strange way about a little girl in white that appeared to her last night. Of course it's all imagination, but I am afraid it looks as if there was something not quite right with her."

"We must have it looked to immediately," I replied, gravely; "perhaps we ought to have had some better advice before. I will send off at once to London for Dr. S—, and as the distance is not great, we may have him with us this evening. In the meantime, will you send Lily to me, and let me hear what she has to say?"

"Now, my darling," I said, as Lily entered the room, "come and tell papa all about it."

She climbed upon my knee, threw her arms about my neck, and hiding her face against my breast, as is sometimes the wont of children when they have something grave to relate, she went on—

"I fell asleep, you know, papa dear, with my thoughts full of this poor little girl. I awoke in the night with a trouble, I could scarcely tell what, upon my mind. When I looked up, I saw standing by my bedside a little girl dressed all in white, and pale—oh! so pale. She held in her hand a wreath of snowdrops like the one that I had made, and looking at me with a mournful expression, but still very very kindly, she stretched forth her hand as if to hand me back the wreath. When I looked again, she had disappeared."

I reasoned for some time with the child, trying to persuade her that what she fancied she had seen was only the result of her own excited imagination; but I could clearly see that though her deference to me prevented her from disputing anything I said, her belief in the reality of what she had seen remained unshaken. I saw too that the feeling on her mind was something more than mere sentiment. I saw how deeply she felt pained that the loved daughter of a thousand years ago should be treated so differently to our loved ones of to-day, and I resolved that, great as the sacrifice was, it should not stand in the way of the happiness, and perhaps the health, of my beloved child.

So at last I said to her, "Well now, my darling, just tell me what you think should be done, and what this little girl would like if she could tell us."

She burst into tears, flung her arms round my neck, and sobbed out—

"O! dear papa, I know you are so fond of it."

"My darling," I said, "all the antiquities in the world are as nothing—*nothing* compared to my dear little girl's peace of mind."

"O, dear papa," she said, through her tears, "how can I ever, ever love you enough!"

"My darling," said I, "I know you love me as I love you. But now, what is it you think this little girl would like?"

"I think that what she wants is to be laid in her grave in peace."

"And so it shall be," I replied; "and it shall be done at once."

So we dug a grave in the corner of the garden where all the departed pets of the family were laid, and had it carefully lined with flat stones like a miniature vault, and therein we two—the puzzled gardener looking on—reverently laid the young Roman girl, with all her little treasures disposed around her, filled in the earth, and set up the stone tablet at the head.

We had scarcely finished our task

when a well-known form was seen stalking up the avenue, and Lily, touching my hand in a little tremor, whispered—

"O papa! Doctor Harris!"

Dr. Harris was the vice-president of the society of which I was president, an ardent antiquary, and in the main a very good fellow. But he was one of those men whose excessive vitality sometimes gives an appearance of roughness to their manner. I knew full well that the sensitive nature of my little girl made her rather shrink from his somewhat boisterous advances; and I had a pretty shrewd guess that poor Dr. Harris, glaring over the remains with his portentous spectacles, was in the mind's eye of the child when she made her appeal on Lucia's behalf. He was, moreover, a man utterly destitute of sentiment, and in fact the last person we should have liked to come upon us in our present employment. I advanced to meet him, intending to explain it to him privately. But as he approached, he hallooed out with all the force of his lungs—

"Lucky dog! I've heard of your discovery. Everything comes to you. Why does not some little Roman girl fling herself into *my* arms?"

And as he spoke he stretched out his arms, either in indication of his readiness to receive such a visitor, or as a salutation to my little girl, who had sheltered herself behind me. I took him aside to explain to him the state of the case.

"The fact is," said I, "that my dear little girl, whose health you know is rather delicate, took it so much to heart, that for her sake I have buried all the relics again."

"I see," he said, "and when the fit's over you'll dig them up again."

"Not so," said I, for some of my little girl's earnestness had imparted itself to me; "she shall lie in her grave for me till God comes to judge the world."

"Well, but, I say," he went on, "suppose I come up some morning

with a brand new doll, promise me you won't stand in the way of business."

"My dear friend," said I, "when you have a little girl like my Lily—I recommend you to take the preliminary steps" (the Doctor was a bachelor)—"you will get to know something of what such little minds are capable."

"Ah!" he said; "*ah!* Now let me in my turn give you a little bit of advice. In case a couple of doctors come up some morning to interview you, if they should try to lead the conversation to this subject, be on your guard lest it should turn out to be a case of *de lunatico inquirendo*."

So saying, all in perfect good humour, "it was," as people said, "his way," he took his departure, leaving me for once not sorry to get rid of him.

By and by the photographer came up, and instead of the relics he was sent for to depict, we found him some work to do in the shape of sundry little groups of merry and happy children.

And towards evening the great physician from London made his appearance. He was one of those few men who, in addition to the skill born of natural sagacity and vast experience, are indued with something of that subtle intuitiveness which is a gift not to be acquired. And moreover, he had that winning charm of manner which makes even the most sensitive of patients yield up their inmost secrets. He listened with much attention and interest to the story we had to tell him, and had a long interview with Lily by herself before he came to us in the study, where we were anxiously waiting for his opinion.

"Well!" he said, "there is no great harm done as yet, but your little girl will require great care—very great care." And he then went into various details, which it is not necessary here to recapitulate. Before taking his departure, however, he said—

"Just one word more. Let me tell you, my friend, you never did a wiser

thing than when you yielded to your little girl's—whim I don't like to call it, for it seems more of a sacred feeling—about the Roman girl. I know well what a sacrifice it must have been, but I frankly own to you that I would not have liked to be responsible for the case of this child—so sensitive as she seems to be to certain deep impressions—with such a burthen on her pure, unselfish little mind."

"I cannot tell you, doctor," said I, "how thankful I am to you for that opinion, for now, thus fortified, I can set down my foot on all cavillers and scoffers. But does there not seem to be something not easy to understand in all this?" I went on. "My little girl retired to rest so perfectly satisfied with what I proposed, that it is difficult to conceive how anything could have arisen out of her own inner consciousness to produce such a remarkable impression upon her mind."

"I think it may be accounted for on natural principles," he replied. "Your little girl's own idea was a genuine one. She felt pained that the remains of a beloved daughter should be exposed to the vulgar gaze like, to use her own words, 'a curiosity.' Your alternative proposal, intended for the purpose of soothing her mind and at the same time keeping your treasures, was, however well-intentioned, something of a sham. Her deference to you, and perhaps a specious show of sentiment in the proposal, reconciled her to it in the first instance. But in the stillness of the night her little mind, brooding over it, waking or sleeping, came at last to see it in its true light, and produced on her, unduly excited as she probably was, this remarkable impression. This seems to me a fair way of accounting for it, but nevertheless I would not say that there is no other. Much as I despise the opinions of those who would have us believe that the spirits of the loved departed come back to twitch our hair and to play tricks upon tables, I dare not say that between two loving and kindred spirits

circumstances may not arise to create a mysterious bond of sympathy for which it is beyond our philosophy to account."

"Something of that sort," said I, "seems to have been the belief of the Romans, who held that the *manes*, or spirits of the departed, attached themselves as guardian angels to kindred spirits yet on earth."

"Well, however it be," said he, rising to take his leave, "there is no doubt that the best cure for all such mental disturbances is a perfect state of bodily health. And I trust that with the return of warm summer weather, your dear little girl may regain all her wonted health and spirits."

"Amen!" said I. "Doctor, amen!"

* * * * *

Summer had come again. The golden sunlight shed a glory on our stately elms, and cast their flickering shadows on the grass; the birds—we all loved and cherished them—sang their blithe carols on every side; all nature around seemed awakened to new life and loveliness. Within, all was darkness and desolation; for the edict had gone forth that Lily was to die, and not to live.

I had prayed, as I had never prayed before, that God would spare me this one ewe lamb, but it was not to be. In spite of all that skill and tenderness could do, the disease had of late so rapidly gained ground, that now even love could no longer hope. She had seen, she told us, the little Roman girl once more, bright and glorious as an angel, with outstretched arms and loving smiles, waiting to welcome her; and too well we knew what that sign meant.

I stole to her bedside for the few minutes during which, in her now weak state, I was allowed to be with her. I found her propped up with pillows so that she could get a view of the loved garden corner where, among the childish graves, the sunlight flecked with gold the grey memorial-stone of

Lucia. Her fair hair, soft and glossy as floss-silk, hung round her in tangled waves, that told of the restlessness of weariness and pain. Her sweet face was drawn in by hard, cruel lines, till the blue eyes stood out unnaturally large and bright; her poor little wasted arms trembled as she stretched them out to me. The wan little face lighted up with smiles as I approached, and, taking her hand in mine, bent over her to listen to her accents, now scarcely above a whisper.

"Oh! dear papa!" she said, "how I have longed for your coming. It is of you I have been thinking all this morning. How good you have been to me always—always—and especially that one time when you gave me up Lucia. She will be the first to meet me, for she will run before the rest, and I will take her by the hand, and lead her up to dear Aunt Mary and grandmamma; and I will take her aside and tell her all, and she shall love you—Oh! how she shall love you! And then, oh, dearest—dearest papa!—when you—come—we —" The lips still moved with loving words, but the feeble voice was choked.

Yet three days more, and I stood again by her bedside—to kiss for the last time the dear lips that should never smile a welcome to me more—to press for the last time the little hand that should never twine itself in mine again. All trace of weariness and pain had passed away; she lay, her long silky lashes veiling her drooped eyes, as in the slumber of innocence and peace. And on her breast—laid by unseen hands—was a cluster of summer violets.

They sleep together in God's acre—the loved ones of a thousand years apart. It was Lily's last request that the little Roman girl should rest by her side under the shadow of the text, "Suffer little children to come unto me."

O, Dulcissima ! Dilectissima !

R. FERGUSON.

FAMINES AND FLOODS IN INDIA.

"All the rivers run into the sea; yet the sea is not full; unto the place from whence the rivers come, thither they return again."—*Ecclesiastes* i. 7.

THE sympathies of England have been so thoroughly aroused by the terrible calamity which has fallen on Southern India that no excuse seems needed for any one, however insignificant his position may be, who should essay to contribute his mite of information on the steps which are necessary for mitigating or preventing future famines in Hindustan. On so important and many-sided a subject it is of course to be expected that the special bias of each thinker will attach a greater weight to the arguments he adduces, and that personal experiences will magnify the efficiency of the remedies he proposes. Still, in the present incomplete state of our knowledge, this can scarcely be deemed an evil; since the thorough sifting of the evidence, which must result from the determination of the English public to arrive at a proper judgment on this grave question, will separate the chaff from such good grain as may reasonably be expected to be found in the gleanings of earnest labourers on so wide a field of research. It is in this sense, therefore, that I venture to ask consideration for such facts bearing on the problem of droughts in the Carnatic as have been noted in a tolerably varied experience of twenty years, which have been chiefly spent in the East.

To arrive at a just conclusion as to what should be done, it is necessary to know what has already been done. A short description will therefore be given of the results of irrigational expenditure which has been made by the English in Southern India, while a brief survey will be taken of what

remains to be done on this head. The grave question will then be raised whether, concurrently with the execution of such works, the unremitting physical decay of the country, which is the consequence of "what men daily do, not knowing what they do," and which is caused by the necessities of a constantly increasing and uninformed population, does not demand the instant interference of the Government? I shall endeavour to impress the extreme urgency of this question on my readers; since not only the efficacy of future outlay on irrigation works, but that which has already been made in the past, depend on its true comprehension. Whatever may be the policy which is ultimately determined upon, with the object of mitigating the effects of famine in India, or whether, indeed, any such policy be adopted or not, I shall show that further neglect of the changes which are being induced by the destructive action of mankind must be replaced by energetic restorative measures, if Nature is to be robbed of her inexorable revenge, and the fatal march of wide-spread calamity is to be arrested.

I remember assisting, in silence, some sixteen years ago, at a conversation which took place within the precincts of the most sacred sanctuary of South Indian vapidty: I mean the bar of the Madras Club. Jones and Brown, of the Civil Service, were discussing a letter which Sir Arthur Cotton, of the old corps of Madras Engineers, had addressed to one of the London journals, on his well-worn topic, the advantages of extending canals of irrigation and navigation in India. It was Agassiz who said that, when a great fact was brought to

light, people first denied its truth, but eventually admitted it, with the qualification that everybody knew it before. The Indian career of Sir Arthur had been spent in urging his views against the crass opposition of a now, happily, obsolete school, and, when he left the country, his arguments had been thoroughly accepted, at least, in principle. Brown and Jones were of the old obstructive party, and had fought in the ranks of the beaten side, which could not brook that an engineer should show a civilian how to develop and improve a Collectorate. But stern facts had been too much for them, for the conversation I mention ended with the sneer, "*Oh! yes, of course; there's nothing like leather!*" These wisecracks had evidently arrived at the last stage described by the Swiss naturalist, and were unwilling to allow the great hydraulic engineer and statesman any credit for the benefits he had conferred on Southern India—benefits, however, which, it may as well be remarked, form the frequent topic of conversation, and call forth gratitude among thousands of the agricultural population of Madras.

People of the stamp of Brown and Jones forget what Sydney Smith said, that—

"He is not the discoverer of any art who first says the thing; but he who says it so long and so loud and so clearly, that he compels mankind to hear him. He is the discoverer who is so deeply impressed with the importance of his discovery, that he will take no denial, but at the risk of fortune and of fame pushes through all opposition, and is determined that what he thinks he has discovered shall not perish for want of a fair trial."

It is the great merit of Sir Arthur Cotton, that through good report and evil report, he persistently preached the necessity of extending irrigation in Southern India; and to such an extent, indeed, did he press his views that one governor of Madras was foolish enough to deny him admission into Government House. That Sir Arthur was no more the discoverer of that necessity of irrigation for the

Madras Presidency than Macadam was the first person who broke up stones for road-making is, of course, perfectly true.

"In no other part of the world," wrote the late lamented Colonel J. C. Anderson, of the Madras Engineers, "has so much been done by ancient native rulers for the development of the resources of the country. The further south one goes, and the further the old Hindoo polity was removed from the disturbing influence of foreign conquest, the more complete and elaborate was the system of agriculture, and the irrigation works connected with it. . . . Every available source of supply was utilised, and works in advance of the supply have been executed, for tanks have been very generally constructed, not only for general rainfall, but for exceptional rainfall. . . . Irrigation from rivers and channels, or by these and tanks combined, was also carried on. . . . On the whole, the channels are inferior to the tanks, for the system of distribution of water from them is very defective."

In the Carnatic alone there are some 30,000 irrigation tanks, while from the top of a hill in the Colar district of Mysore, it is said that 400 of these works can be counted.

Now in considering facts like these, it may perhaps be asked, In what lies the importance of the services which Sir Arthur Cotton has rendered to the Government and to the population of Southern India? For many years, it may be remarked, there was an influential party of officials (chiefly, of course, civilians) who denied that any public benefit whatever had accrued from the expenditure which had been entered into in consequence of the perpetual worrying of the Government by Sir Arthur Cotton and those who supported him. Figures have, however, recently become available, which show the results of outlay made upon some important irrigation schemes in the Madras Presidency during the past forty years. Since these figures, besides their general interest, have a special bearing on the state policy of *extraordinary* expenditure on Indian Public Works—a policy that has been vehemently attacked in some quarters—I shall submit a *résumé* of them to my readers. It should be remarked that the figures,

which have been arrived at after years of contention, are due to the investigations of an official committee, in which both engineers and members of the Civil Service were represented. I would specially recommend these results to the consideration of Mr. J. Dacosta, who stated in a letter to the *Daily News* that—

“A fact worthy of particular attention with regard to the irrigation works in India is, that while the schemes devised or carried out by the British Government have, as an almost invariable rule, proved to be failures, the native works (some of which we restored and enlarged) have been successful, and have supplied the great bulk of the artificial irrigation hitherto enjoyed.”

I will now state the disbursements and receipts for each of the works about to be specified; up to the latest date for which the detailed figures are available.

(a) *The Godavery delta system*: a British work.—For this, it appears, that up to the 31st March, 1875, the outlay was 691,055*l.*, while the net revenue receipts which were due to this outlay, amounted to 1,746,822*l.*, that is, there was a *prima facie* gain of 1,055,767*l.* The committee were, however, instructed to add to the capital outlay the interest charges upon it; and the outlay *plus* the interest thus amounted to 1,160,915*l.* On the other hand no interest was allowed to be credited on the past revenue derived from the works; so that, by this one-sided arrangement, the payments into the treasury, in excess of capital and interest charges, were reduced to 585,907*l.* Had such interest been allowed upon receipts, or had receipts been taken in reduction of capital outlay, the balance standing to the credit of the Godavery delta works would have been 947,340*l.* on the 31st March, 1875.

(b) *The Kistna delta system*: a British work. — Up to the before-mentioned date, the outlay amounted to 449,390*l.*, while the interest charges were 264,666*l.*, making a total of 714,056*l.* The net revenue amounted

to 686,621*l.*, and the account, therefore, shows a loss of 27,435*l.* But had interest been allowed on surplus receipts, as a set-off against interest on outlay, the less than half-finished Kistna works would have had a balance of 84,600*l.* to their credit.

(c) *The Cauvery delta system*: a British extension and improvement of a Native work.—The capital outlay amounted to 134,809*l.*, while the interest on this was 124,545*l.*, thus making the charges 259,435*l.* up to the same date as before. The revenue returns up to 31st March, 1874, were 2,146,345*l.*, or say 2,254,345*l.* up to the 31st March, 1875—since the net annual revenue is about 108,000*l.* The balance standing to the credit of the works, according to the system of account laid down, is therefore the difference of 2,254,345*l.* and 259,435*l.*, or 1,994,910*l.* only; but had interest been allowed on net revenue receipts as well as upon outlay, the balance standing to the credit of the Cauvery irrigation system would have been 3,294,040*l.* on the last date mentioned.

The general result of these three irrigation systems, as regards balances of receipts above charges, is therefore—

	With Interest.	Without Interest.
Godavery .	£947,340	£585,970
Kistna .	84,600	27,435 <i>minus.</i>
Cauvery .	3,294,040	1,994,910

TOTALS .£4,325,930 £2,553,382

N.B.—In the foregoing figures two shillings have been taken as the value of one rupee.

Now the whole outlay of the Madras Public Works Department during the past forty years upon the above three delta systems, and on thirty-two other comparatively important irrigation schemes in Southern India, has been less than two-and-a-quarter millions sterling. Of this expenditure, 1,275,335*l.* disbursed upon the Godavery, Kistna, and Cauvery systems have been recouped, while the interest charges thereon have been repaid.

The accounts for five only, out of the thirty-two other schemes, have been ordered to be prepared; while those for the remaining twenty-seven works will probably never be compiled; but taking the extreme supposition that all have been entirely unremunerative in the past (which, however, it may be said, *en passant*, is not the case), and that the interest charges amount to 75 per cent on the expended capital, the sum remaining to be recovered on these works will be—

Capital	£974,665
Interest	730,992
TOTAL	£1,705,657

Deducting this from the amount of 2,553,382*l.* standing to the credit of the Godavery, Cauvery, and Kistna works, the net profits, according to the one-sided system of accounts that has been described, are 847,725*l.*; and would have been 2,620,323*l.*, had interest been allowed on surplus receipts paid into the public treasury, or had such receipts been taken in reduction of capital outlay.

At the lower computation it is thus seen that, at any rate, a lump sum of about 850,000*l.* has been gained; or, at 4½ per cent, an annual income of 38,250*l.* Besides this, the present net annual revenue of the three great irrigation systems of Southern India stands as follows:—

Godavery	£145,000
Kistna	70,000
Cauvery	108,000
TOTAL	£323,000

i.e. the above works are paying respectively 21, 15½, and 80 per cent per annum on the capital outlay made upon them. For the expenditure, therefore, that has been incurred, an annual revenue of 361,250*l.* has accrued; and this return, it must be remembered, is the Government share only of the profits resulting from increased production. The natives of Southern India in these three localities alone have also acquired an increased

annual revenue of at least one-and-a-half million sterling, or a capital of thirty-three-and-a-half millions has been added to the value of the lands they cultivate; to say nothing of their indirect gain by the development of trade at the port of Coconada, which the Godavery delta works have been the means of creating. Taking the gain to the state, and the gain to the people, the actual wealth that has resulted to the country amounts to at least forty-five millions sterling, from the policy the Government has pursued during the past forty years.

The further expenditure of about one and-a-half millions sterling that is required to bring the three great delta systems and the next five more important and still unfinished irrigation schemes of Southern India to their full development, may be expected to bear analogous results. The interest on this expenditure may be anticipated to raise the total charges to three millions sterling before the works are entirely completed, so that the future annual charge on this head would be 135,000*l.* per annum.

Hazarding the extravagant supposition that this necessary outlay will not increase the future revenues by a single shilling above their present amount, the actual gain by carrying out the above specified irrigation works of Southern India would still stand at more than 226,000*l.* per annum!

As a matter of fact, it is beyond all question that the further necessary outlay on irrigation in Southern India will not only cause the revenue to rise steadily, but will add to those guarantees against famines which all people must now be convinced are more and more urgently demanded as the numbers of the population increase. The second-class system of the Pennair river irrigation of Nellore has been an entire success, seeing that the return of net revenue on the capital outlay has reached 11½ per cent. The now nearly completed system on the Tambrapourney river of Tinnevely, which will cost about

120,000*l.*, already returns nearly four per cent, and may be expected to reach as much as 10 per cent when the whole of the lands to be watered come under its influence.

Even the unsatisfactory situation of the Madras Irrigation and Canal Company, that entails a present charge of about 80,000*l.* per annum on the Indian revenues, does not affect the position taken up in the foregoing sketch of the benefits which have been derived from this class of outlay by the state. I have not the information that would enable me to explain the causes of this financial *fiasco*. Nor have I that sufficient acquaintance with other parts of India which would justify me in entering on the causes of certain irrigation works in the Northern Provinces being much less remunerative than in Madras. Still every one with the most elementary knowledge of the subject is aware that topographical advantages, as well as the existence of a system of irrigation tanks, whose previously fluctuating revenues were guaranteed immediately upon the opening of canals which supplied them, are the chief reasons of the enormously favourable results which have been obtained in the south as compared with the north of India. All such considerations are, however, beside the fact of the efficiency of irrigation works as a safeguard against famine. In Bengal alone, where there was a dead loss on such works to the imperial revenues during 1875-76 of 203,700*l.*, it is important to note, that in the year of drought 1873-74 the value of the crops saved by one such unfinished system of canals amounted to 480,000*l.*! Similarly, it is certain that the canals of the Madras Irrigation Company have saved thousands of lives during the present calamity, while the cultivators have been driven by dire necessity from the blind adherence to old customs, and have taken up in this year some six or seven times the quantity of water they used last year on agriculture. It appears therefore that even in a strictly commercial

point of view the works of the company, notwithstanding the pecuniary waste that has occurred upon them, may be regarded hopefully.

Such is the outcome of the policy which, without doing injustice to many other officers of the Madras Engineers who ably supported him, may chiefly be ascribed to the genius and foresight of Sir Arthur Cotton. And though no such enormous results as have been obtained in the Cauvery delta can be looked for from future outlay in Southern India, and though no other delta remains, like that of the Godavery, to be transformed from comparative desolation to fertility, there is yet a material increase of revenue, and a co-existent increase of national wealth, to be obtained in the first locality, as well as in the central portion of the second. Besides these, the Kistna works yet remain half finished, in consequence of the refusal of the Government of India to allot funds for their energetic prosecution, until the whole of the detailed estimates, which will amount to more than a million sterling, have been prepared and submitted. Concurrently with this refusal, the local engineer establishment which must prepare these estimates is kept by the same supreme authority on the most insufficient scale. Such a course must have the effect of indefinitely, if not dangerously, delaying the day when thousands of acres of land shall be brought under irrigation to supply large quantities of food for the population of less happily situated districts in times of future scarcity. It is a case like this that makes Madrassees sigh for the decentralization of Indian Government which is recommended by Mr. Bright. However, the present sufferings of the Southern Presidency will not have been in vain should public opinion declare itself sternly against the continuance of so suicidal a policy on the part of the Government of India.

So far therefore from outlay on irri-

gation having occasioned any financial embarrassment, or being likely to do so, in Southern India, it is clear that it has permanently increased, and in every probability will steadily continue to add to the resources of the Government and the general wealth of the people. With these facts before us, can it be wondered that Mr. Bright should lead the way in pressing on public attention the proposals of the eminent hydraulic engineer to whose initiative and consistent, unremitting counsel such enormous benefits have already been conferred upon the people of Madras?

It may, of course, be just possible that the critics of Sir Arthur Cotton's policy are in the right, and that he imperfectly appreciates the needs and dangers of India. But the fact is, that on the one side stands a successful specialist, while on the other stand his opponents, of whom it is no disparagement to say that neither in knowledge nor in practical experience do they pretend to approach the authority whom they criticise! "Under which king, Bezonian? Speak, or die!"—for a dying matter it is for the millions of India, as sad experience has shown.

It will not have escaped the penetration of my critical readers, that in the sketch which I have submitted of the effect of outlay upon irrigation projects in the Madras Presidency, I have prominently noticed those great works, where the volume and continuity of the available water supply, as well as the favourable features of the country, have offered very advantageous conditions for success. This course has been necessitated by the circumstance, that for these great works alone have the capital and revenue accounts been as yet compiled from the state records. The results are sufficient to give a complete denial to those who have had the stupid audacity to advance that the incomplete figures, formally available for these schemes, were nothing but "a gigantic swindle!" Future investi-

gation of records will doubtless show for those secondary works of which the capital and revenue accounts have not yet been compiled, that the great bulk of the expenditure which has been devoted to irrigation during the past forty years (and there was none of any moment previously) has permanently added to the wealth of Southern India, out of all proportion to the money which has been temporarily advanced for this purpose. Incomplete figures are however available for one of such irrigation systems, viz., that of the Palar River, and these may now be mentioned; more especially as I am about to offer some remarks upon the works of which these may be taken as a type. The essential difference distinguishing the three great delta systems from the greater part of the old native works of the Madras Presidency consists in the fact that the food supply, which is a matter of certainty in the former, goes far to make up for the precarious nature of agricultural operations in the latter. And between these two extremes is a third class of works, which have been designed to utilise intermittent supplies of water by supplementing the deficiencies of the local rain-fed reservoirs.

It would seem that the revenue derivable in a bad year from the Palar works, which belong to the class last mentioned, does little more than pay their actual working expenses; though at the same time the results of a series of years are considerably more favourable. For example, up to the 31st March, 1873, the difference between the net revenue paid into the Treasury and the interest charges on the capital outlay amounted to 47,962*l.*; or, in other words, something less than one half of the original expenditure had been recouped. These irrigation works appear to have been designed for the distribution of more water than experience has shown to be available in ordinary years, and in this respect they may be admitted to be a failure, since the profits which were anticipated

from the outlay made upon them have not generally been obtained. The Palar drains a tract of country entirely dependent upon the rainfall of the north-east monsoon; and it is evident that it must be a more expensive matter to draw a supply for a given area of cultivation from a river which may be in fresh for ten days only in a year, than from one which is in fresh for sixty days in the year, as is the case with even the Pennair River of Nellore.

The question arises, how it was that more water than experience has shown to be actually available was counted on by the designers of the Palar works? And I venture to think that the answer to this question will materially assist the comprehension of the *modus operandi* of drought in South India generally, and will indicate the remedies which are in consequence called for.

Out of the twenty-one districts of the Madras Presidency, eighteen are almost entirely removed from the influence of the heavy rain, which falls during the south-west monsoon on the slopes and summits of the Western Ghats. In some of these eighteen districts there are rivers, such as the Godavary, the Kistna, the Cauvery, and the Tambrapoorney, whose sources are partially fed by these rains, and such rivers consequently carry tolerably continuous streams; which are utilized in the enormously advantageous way already set forth. But, over the greater part of the Madras Presidency, the uncertainty of the rainfall during the north-east monsoon necessitates the storage of water for agricultural purposes, and the numerous irrigation reservoirs which are scattered over the face of the country are the outcome of this need of the cultivators. Now, as heretofore, in the words of the historian Orme,

"The revenues of the Carnatic depend on the quantities of water which are reserved to supply the defect of rain during the dry season of the year; for this purpose vast reservoirs have been formed, of which not only the con-

struction, but even the repairs in cases of inundation, require an expense much beyond the faculties of the farmer or renter of land. If, therefore, the avarice of the prince withholds his hand from the preservation of these sources of fertility, and at the same time dictates to him an inflexible resolution of receiving his usual incomes, the farmer oppressed oppresses the labourer, and the misery of the people becomes complete by the vexations of collections exercised in times of scarcity, of which the cruel parsimony of the prince has been the principal cause."

Now the Palar flows through the centre of the tract of country whose former agricultural and fiscal economy is described in the foregoing passage.

It obviously became the duty of the British Government on succeeding to the possession of the Carnatic to take every means to do away with such a precarious state of matters, and to put agriculture on a firmer basis, by intercepting the drainage water carried down by the river to the sea, and to divert it through channels to be stored in the reservoirs which studded the face of the country. In this way, the indefinite nature of the cultivation of the Carnatic could, in ordinary years, be changed into a certainty, and food for the population would always be guaranteed, except in seasons of *minimum* rainfall.

It cannot be more than twenty-five years since the Palar works were commenced, and at that date there were trustworthy rainfall observations at the neighbouring observatory at Madras for a period of forty years previously. These records would certainly have formed a tolerably sure guide for estimating the precipitation in the drainage basin of the river, when taken in conjunction with such observations on the actual volume of the flowing stream as were doubtless made at the time the project was being matured. If, therefore, the present quantity of water flowing down the Palar is found to be much less than that for which the details of the scheme were designed, are we necessarily driven to the conclusion that the designers of the Palar works fell into a blunder? I venture to

think not, and will now give reasons pointing to the conclusion that the inadequate irrigative powers of this and other rivers of South India are due to a constant continuous change in the physical aspects of the country through which they flow. Moreover, it is on the re-establishment of previously existing secular conditions that a chief dependence must be placed for modifying the disastrous action of drought in Southern India generally. Until this particular problem has been satisfactorily grappled with, I confess I see but qualified advantages to be gained from the expenditure of money on such irrigation works as are chiefly dependent upon the rainfall of the north-east monsoon for their efficacy. At any rate, the solution of the problem will make all the difference whether future outlay on extensions and improvements of old works or on new works falling under the category specified will be a decided financial success; or whether one more weapon will be added to the armoury of those who think it useless to interpose for preventing the workings of natural checks upon a perpetually increasing population that is already of enormous dimensions. Some good people suppose that it is to emigration we must look for establishing a balance between the population and the available supplies of food. This resource may come into play in some dim future; but meanwhile it cannot be too earnestly noted that starvation and disease will replace the checks of old times. What those checks on the increase of the Indian population were, the readers of Orme's *History* will recall from the vivid accounts which are given in the pages of that work of the terrible inroads made into the Carnatic by the marauding armies of the Mahrattas during the greater part of the eighteenth century. Their leading idea in making war was, says the historian, to do "as much mischief as possible to the enemy's country. This they effect by driving off the cattle, destroying the harvest, burn-

ing the villages." . . . The long continuance of these horrors, culminated in 1782, when a crisis supervened, which is thus described by a writer in the seventh volume of the *Asiatic Journal*:—

"For some years previous Hyder Ally had carried on a successful war against the Company, and had collected almost the entire revenue of the Carnatic. The whole country was overrun by his cavalry. . . . The Company's finances were at the lowest ebb, and their credit exhausted. The Madras army was paid and fed from Bengal. The calamities of war were at this time made more terrible by the effects of a dreadful famine which depopulated the Carnatic. The streets of the Fort of the Black Town, and the Esplanade of Madras, were covered with starved wretches, many of whom were dead, and others dying. The vultures, the pariah dogs, jackals, and crows were often seen eating the bodies before life was extinct!"

Then, as during the present calamity, and as it has ever been in India, the famished millions came to the seat of Government to draw their last breath, and so to cast a last silent reproach in the teeth of their rulers!

In perusing the narrative of Orme, the Anglo-Indian of to-day can scarcely fail to be struck with the frequent mention made of the thickets and forests which covered the now bare and arid plains of the Carnatic and the adjoining provinces. Scarcely a battle took place whose site was not in the neighbourhood of woods, while a detailed description is given of the jungles formerly covering the country from the latitude of Pulicat on the north to that of the Coleroon on the south. "Many of these wilds," says the historian, "are from fifteen to forty miles in circumference," and swarmed with game. It would be useless to quote the numerous extracts describing past aspects of the country, and showing to what an enormous extent the jungles of the Carnatic, and of the Peninsula generally, have been cut down during the past century. One very interesting passage of this nature refers to the thick woods surrounding the stronghold of the Rajahs of Bobbily, in the Northern Circars,

the site of the fearful tragedy in which Bussy was made an unwitting tool by an ancestor of the present Maharajah of Vizianagram. It is but a few days ago that I visited the locality, and as far as the eye could reach there was nothing but a sheet of rice-fields under artificial irrigation. Such are the changes which a century of peace and order has induced on the physical features of a part of Hindustan, the vastness of whose ancient forests is specially mentioned in the Rāmāyana, where the whole country between the Jumna and the Godavery is described as a wilderness. But this is a digression from the actual locality with which we are concerned.

It will be scarcely necessary to refer my readers to the pages of Mr. Marsh's work, *The Earth as Modified by Human Action*, for the proof of the fact that, as forests are cut down, the springs which flow from them, and consequently the water-courses which are fed by these, diminish in number, continuity, and volume. Observations in all parts of the world have established the fact that the diminution of flowing water has invariably followed the destruction of forests. Nor has the removal of woods a less certain or less marked effect upon the character of floods both in rivers and in torrents.

"The surface of a forest," says Mr. Marsh, in the work just mentioned, "can never, in its natural condition, pour forth such deluges of water as flow from cultivated soil, since vegetable mould not only absorbs nearly twice its own weight of water, but when saturated gives off moisture to the mineral earth below. The bed of leaves, moreover, that has not yet been converted into vegetable mould itself retains a very considerable proportion of rain, while the stumps and roots of fallen timber, the mosses, fungi, &c., in all forests oppose a mechanical resistance to the flow of water over the surface, and so sensibly retard the rapidity of its descent down declivities, and divert and divide streams which may have already accumulated from smaller threads of water. . . . Rivers fed by springs, and shaded by woods, are comparatively uniform in volume; they carry but little gravel or sediment from the high lands whence they flow, and their channels, therefore, are subject to gradual changes only."

Now the meteorological conditions of the valley of the Palar and of Southern India generally may not incorrectly be gathered, as I said before, from the observations recorded at the Madras Observatory. In the period including the twelve years from 1864 to 1875, the average number of days during which the north-east monsoon lasted was thirty-eight, while the average quantity of precipitation was 27·6 inches. It has already been explained that the north-east monsoon is the chief source which feeds the minor rivers of the Madras Presidency flowing into the Bay of Bengal. On the annual rainfall of 27·6 inches the cultivation has chiefly to depend; and were it possible to count on this average with tolerable certainty it would be a simple enough matter to calculate the exact state of the food supply of the country subjected to its influence. However, the question is not one of averages, but of extremes, as the following facts will show:— During the period of the twelve years just specified, the year 1867 had a rainfall during the north-east monsoon of 10·4 inches only, *i.e.*, 17·2 inches less than the average, and 21·4 inches less than the rainfall of 1866; a deficiency which, it is needless to say, could scarcely be compensated for by any quantity of water which could possibly be stored in existent irrigation reservoirs. Again, the north-east monsoon of the year 1872 had a rainfall of 24·8 inches above the average, and 20·7 inches above that of 1871. In such a year as 1872 the effects of an excessive fall of rain in Southern India will be that each drainage line will be changed into a torrent, and, rapidly filling up the first or highest of the chain of irrigation tanks which have been constructed along its course, will breach it. The whole body of flowing drainage, strongly reinforced by the contents of the upper tank which has burst, rushes violently down to the next tank, breaches that, and then precipitates itself upon and destroys the third one, and so on. This

process, it must be remembered, is going on along scores of secondary valleys, whose floods pour into the main river, and sweep away expensive railway-bridges or cause destructive inundations of crops growing upon its banks. Should the river be crossed by a weir, or *anicut*, as it is locally called, the probability is that this work, together with its subsidiary sluices which regulate the entry of water into the irrigation canals, are more or less seriously damaged, and their usefulness is thus impaired until they have undergone expensive repair. During extreme floods of this nature it is quite possible that the whole of the cultivation under the tanks, and other irrigation works of the affected district, may be completely ruined; and should a year of scanty rainfall unfortunately succeed such a year of flood, a famine will inevitably supervene, and widespread calamity among the people will certainly result.

Turning to the recorded figures for the flood discharge of the Palar River, we find that at Arcot, above which the drainage basin has an area of 3,700 square miles, a volume of 270,000 cubic feet per second, or a discharge of 74·3 cubic feet per second per square mile has been registered. Now an extraordinary flood in the Arve, which is a mountain torrent draining perhaps the most precipitous and snow-bound district in the world, amounted, *after eight days of continuous heavy rain* in May 1856, to as much as 21,700 cubic feet per second, *i.e.*, nearly 29 cubic feet per second flowed off each square mile of the drainage-basin of 770 square miles. The drainage carried by the Palar (whose basin, it must be noted, is about five times larger than that of the Arve) is consequently 45 cubic feet per second per square mile in excess of that carried by the Arve during a maximum flood, and some conception may be formed from the contrast of the enormous rate at which rain must be discharged from the surface of the comparatively level country that the Indian river

traverses. Of course it should not be forgotten that in the case of the Palar we are dealing with tropical rainfall; but the extreme instance that has been given from the Arve narrows the difference in this respect as much as possible. Compared with the basin of the River Pennair above Nellore (which again, however, is five and a half times the size of the drainage basin of the Palar above Arcot), we find that this latter river discharges 56 cubic feet per second per square mile more than the former. In this case, again, an exact comparison cannot be made, since the larger size of the Pennair basin must act as a moderator of floods, just in the same way that the larger area of the Palar basin as compared with that of the Arve should have exemplified, had its physical characteristics not prevented it from doing so. But however inexact the parallels drawn may be, there cannot be the shadow of a doubt that the quantity of water flowing from every square mile of country that is drained by the Palar in maximum flood would suggest the existence of those evils which are mentioned in the passages quoted from Marsh even to people who have never visited the Carnatic.

To put this in a clear light we may consult the Madras rainfall figures for the years 1874, 1875, and 1876 and see what relation they bear to the calamity of 1877. The precipitation which occurred during the three years specified was respectively as follows:—36·9 inches, 20·9 inches, and 6·34 inches. Or, in other words, in 1874 there were 9·3 inches *more* than the average fall, while in 1875 there were 6·7 inches *less*, and in 1876 there were 21·26 inches *less* than the average rainfall. The results show that while in 1875 the rainfall was 16 inches less than in 1874, that of 1876 was 14·56 inches less than in 1875; that is to say, a year when rain fell in quantities well above the average was followed by one of rain well below the average, and this again by another of very

deficient rainfall. The error must not, however, be made of supposing that 1874 was a very exceptional year as regards rainfall, for this was not the case, seeing that the precipitation was but 9·3 inches above the mean; while 1872 (for example) had a rainfall of 24·8 inches above the mean of the north-eastern monsoon, which is the season we are at present considering. The year 1874 was, in fact, a very favourable one for agricultural operations, and was not generally characterised by disastrous floods. These of course did some damage, but much less than in 1872, when the rainfall of the north-eastern monsoon amounted to 52·4 inches, or 24·8 inches above the average, as has already been stated, and of the floods of that year a word will be said hereafter. But though 1874 was a most profitable year for agriculture in Madras, much damage was nevertheless done by the moderate excess of rain which fell.

This will be plain from the report of the Madras Revenue Board for the year ending 31st March, 1875, which states as follows:—

“The quantity (of rain) registered in the districts of Cuddapah, Bellary, Kurnool, North Arcot . . . was the largest within the last ten years. The excessive rain that fell in the month of October, and the floods which rose to an unprecedented height in the districts of Nellore, Cuddapah, Kistnah, Kurnool, Chingleput, North Arcot, South Arcot, and Tanjore, in the months of July and September, caused breaches in the banks of the principal rivers and tanks, and to some extent injured cultivation; but the damage done was not very great, and entailed the granting of but slight remission of land assessment. Very serious injury, however, was done to public works in the districts of Nellore, Kurnool, and North Arcot. In the last-mentioned district the Palar and Poiney *anicut*s were destroyed, and the Cheyar *anicut* sluices washed away, and the collector reports that ‘so disastrous a season for public works has not been experienced for many years.’”

This passage shows exactly what might have been expected, viz., that in the Carnatic itself—the part of the country which, probably more than elsewhere, has had its jungles cleared—

the greatest damage resulted from the moderate excess of rainfall which benefited most of the other districts of the Madras Presidency. Moreover, the water which flowed so rapidly off the arid and timber-denuded country was lost for the succeeding year, whose rainfall was below the average, and agricultural operations were consequently a failure in 1875.

“The season,” says the Report of the Madras Revenue Board for the year last mentioned, “was a remarkably dry one, and contrasted very unfavourably with that of the preceding year. The south-west monsoon failed altogether, and the north-east monsoon also to a considerable extent. The principal rivers received their freshes very late, and they were, except in the Kistna and Godavery, very scanty. The commencement of cultivation operations was thus retarded, and there was not sufficient water to bring the crops to maturity. The tank cultivation suffered most, but dry cultivation also suffered heavily, and the yield was considerably below the average. There was also a scarcity of drinking water in some districts. The districts which suffered most from the drought were Bellary, North Arcot, South Arcot, Chingleput, Salem, and Tinnevely. In these districts extensive remissions have had to be granted, and the collection of revenue to be suspended. There was a considerable failure of crops also in the districts of Elizagapatam, Cuddapah, Tanjore, Trichinopoly, Madura, Nilgiris, and South Canara. Fears were entertained of distress in the districts of Bellary, North Arcot, Chingleput, and South Arcot, and relief works were opened in some places. Soon after the close of the year, however, there was a favourable change, which happily removed all cause for serious apprehensions of famine.”

But the failure of the rains, more especially of the north-east monsoon in 1876, redoubled the gravity of the situation, and the disaster of 1877 became a certainty for any one who had followed the signs of the times.

Hitherto reference has merely been made to the rainfall of the north-east monsoon; but the line of argument already entered upon will be seen to have still more cogency, should the figures relating to the total precipitation of the year be taken; in other words, should the rainfall of the

south-west monsoon be included. Take the example of the famine of 1832. From the Madras Observatory rain-register we find the mean yearly quantity of precipitation for sixty-three years, from 1813 to 1875, to be 48·46 inches. The rainfall of 1831 was 44·35 inches, or 4·11 below the average, while that for 1832 was but 18·45 inches, or 30·01 inches below the average, and at the same time 25·9 inches less than in the previous year, 1831. Besides this, 1828, 1829, 1830, were all years of deficient rainfall, and the harvests must have been correspondingly bad, and thus have added to the scarcity of the food supply which resulted in the famine of 1832. But, on the other hand, 1827 was a year of very plentiful rain, the amount registered having been 88·41 inches, or 40·05 inches above the average. Had, therefore, the drainage water of this year, instead of running uselessly and rapidly to sea, been protected by forest growth, and so have ensured the permanency of natural springs, the deficiencies of the five years, 1828-1832, might, to some great extent, have been provided for. For the mean rainfall of the six years, 1827-1832, amounted to 43·07 inches, which is but 5·39 inches below the mean of sixty-three years, and that much less rain than the mean quantity enables an ample food supply to be raised is shown by the fact that, in the four years, 1833-36, immediately following the famine of 1832, the amount of rain registered was respectively less than the average by 11·35, 9·46, 6·99, and 3·70 inches—i.e., there was a mean deficiency of rain for these four years of 7·88 inches yearly, without any disaster supervening. This, of itself, is sufficient to show what a large proportion of the annual rainfall which by conservative and restorative measures might be stored for use in bad years is now absolutely lost. The famine of 1853 is an extreme example of the truth of the proposition, that drought in Southern India should not entirely be attributed

to the effect of deficient rainfall, but is due to a very great extent as well to the occurrence of previous heavy falls of rain, which uselessly flows away. In 1851 and 1852 the falls were 64·32 inches and 72·69 inches respectively, or 15·86 inches and 24·23 inches more than the average, while in the following year, 1853, there were 35·82 inches registered, or 12·64 inches less than the average. The deficiency of this year should scarcely, however, of itself have caused a famine, for we have already seen that the ordinary years, 1833 and 1834, which immediately succeeded the famine of 1832, had a deficient rainfall of 11·35 inches and 9·46 inches respectively; whereas 1853 not only followed 1852, in which there was an excess rainfall of 24·23 inches, but 1852 followed 1851, in which there was also an excess of 15·86 inches. The real notable point is that, in the year 1853, the fall was 36·87 inches less than in 1852, or, in other words, the difference of precipitation amounted to three-quarters of the whole yearly mean rainfall of Madras. I can, unfortunately, procure no records of 1851 and 1852; but it may unhesitatingly be asserted that the excess rainfall of both these years, after doing extensive damage to irrigation works and to the crops, ran uselessly to sea, in lieu of draining gently through the soil into reservoirs and wells, where it might have provided for the drought that occurred in 1853.

If now we divide the sixty-three years, from 1813-75, into three equal periods of twenty-one years each, we shall find the average of the differences of rainfall between one year and the year following to be as follows:—

	Inches.
From 1813 to 1833 . . .	20·071
„ 1834 to 1854 . . .	12·800
„ 1855 to 1875 . . .	13·370

It seems from these figures that such ill-effects as the crops of the Carnatic suffer from floods and succeeding droughts should have been expe-

rienced in greater intensity in the earliest of the three periods, when the country was certainly more timbered than now. But, as the evils referred to are more patent at the present time than formerly, it follows that the *déboisement* of the last half century has exaggerated the harmful effects of the lower yearly difference of rainfall in the latter periods beyond the standard of the damage inflicted by the higher yearly difference of the first period. Of course the population has increased enormously between 1813 and 1875; but this is an additional reason for regarding with a more critical eye such physical phenomena as might pardonably have escaped attention three-quarters of a century ago, when the proportion between the population and their power of raising food was much more favourable than it is at the present day. We shall find, indeed, this reasoning to be strengthened by looking at the yearly differences more closely; for it appears that not only the *average* differences, but the *extreme* differences, have also decreased, and this more regularly. Thus, the average of the three *maximum* differences of yearly rainfall for each one of the before-specified periods is as follows:—

	Inches.
From 1813 to 1833	41·37
„ 1834 to 1854	35·58
„ 1855 to 1875	32·10

The secular effects of rainfall in Southern India should have, therefore, year by year, been more favourable; but since such has not been the case, other physical conditions must have interposed and more than neutralized the benefits which ought to have accrued from the gradual improvement that has taken place in the regularity of the yearly precipitation. It has sometimes been advanced that the growing intensity of Indian famines is due to an absolute decrease of rainfall; but a reference to the Madras rain register scarcely bears out the statement. Thus, in the three periods of twenty-one years, between 1813 and

1875, the average precipitation was as follows:—

	Inches.
From 1813 to 1833	47·63
„ 1834 to 1854	50·71
„ 1855 to 1875	47·04

Consequently the clearings of jungle which have been made during the past three-quarters of a century have not affected the total quantity of rain falling; and as the physical effects of drought have absolutely increased in intensity, this increase must be attributed to the removal of those conservative influences which former aspects of the country possessed.

To understand what actually occurs in Southern India during a year of heavy rain reference may be made to the reports for the year 1872. From a revenue point of view the season, of course, was reported as having been good, since the net increase over the collections of the preceding year was more than 85,000*l.*, of which about 60,000*l.* was due to a decrease under the head of “remissions” of land revenue, on various accounts, but chiefly for “failure of cultivation,” as compared with this item in 1871. However, the Administration Report says:—

“The year began with a cyclone . . . doing great damage in Chingleput, South Arcot, North Arcot, and Salem, and making itself felt even in Tanjore and Trichinopoly. Vellore in North Arcot was inundated by the bursting of tanks above it, and many lives were lost; 50,000 cattle died in Salem. The north-east monsoon began early, and was very heavy at first. There were inundations in the Godavery and Kistna districts. Many huts sunk in the mud at Madras, and it was possible for some days that two large tanks not far from the town, and on a higher level, would burst and do great damage. A portion of the line of railway was swept away in North Arcot. . . . Cattle disease was not very prevalent, and does not seem to have been very severe in any districts; but large numbers died in Vizagapatam, Godavery, North Arcot, and Salem, from the effects of the unusually abundant rain.”

The collector of Chingleput reports that

“Considerable damage was done to the irrigation works by the heavy floods. . .

Keshaveram *enicut*, at the divergence of the Cortelliar and the Coum . . . was almost destroyed by the autumn floods."

The Cortelliar is the river principally used for irrigation in this district, and its sources lie in the hills some forty miles from the Coromandel coast, just where the Eastern Ghauts turn west to form the northern boundary of the Carnatic. Twenty-five years ago the slopes and bases of these hills were covered with thick jungles, all of which have been subsequently cut down for use as fuel on the Madras Railway. The consequence of these extensive clearings has been that at the present time the river is in violent flood for as many days during the north-east monsoon as formerly it was in moderate flood during weeks!

"North Arcot, like Chingleput, suffered much from the cyclone, and from the floods of the north-east monsoon. Many tanks were breached, occasioning loss of property, and in the case of the two tanks above Vellore, upwards of one hundred lives were sacrificed."

And so forth. It would be tedious to my readers to continue quotations showing what damage is done to the irrigation works in Southern India during a burst of heavy rain. However, a few words require to be added on the effect of these floods on the public health. "Notwithstanding," says the Revenue Board—and the use of this word seems to indicate a suspicion that something "is rotten in the state of Denmark,"—"notwithstanding the abundant rain, the year was not a healthy one, and the amount of mortality during the year was greater than in its predecessor." Such a state of things is chiefly due to the fact that during a season of heavy rain much of the country is turned into a swamp from interference with those conditions which would have regulated the flow of natural drainage. What should have been a blessing to the population was, in fact, turned into a curse, from forgetfulness that the earth was given to man to enjoy and not to destroy. Fever especially raged all over the Presidency, and the

deaths from this disease were 37,949 more than in the preceding year!

A letter has recently appeared in the columns of the leading journal bearing the signature of a well-known member of the Madras Revenue Board who has filled several still more prominent situations in the local Indian service. The writer's object was to dissipate several popular English fallacies in connection with the question of Indian famines. One such fallacy was that an expenditure of several millions sterling on the construction of irrigation works would be a sure preventive of future calamities of this nature. Of twenty millions of acres under cultivation in ordinary years, he states that probably four-fifths are occupied by the inferior dry grains which form the invariable food of the poorer classes of the people. Rice, he says, is much too expensive an article for their food. Considering the fact that the Madras railway lines have been chiefly engaged in carrying rice into the distressed districts, it would appear that the famine is for the most part due to a deficiency of this grain, which could not be grown during the drought that prevailed, and the expenditure on irrigation works deprecated by the writer, would thus certainly seem to be called for. But putting this aside, it is evident that the poorer classes would eat the superior food if they could procure it, and this they can only do when irrigation works shall be largely extended. And, as a matter of fact, dry cultivation is immediately given up for wet cultivation, should a tank for storing water be formed to command the fields. Rice is unquestionably the staple food of the people, and will be grown wherever it becomes possible to do so. Ragi and other dry grains are merely a *pis aller*, because the land utilised in growing them will not produce rice. However, even for the cultivation of the inferior grains some water is required, and the letter goes on to say that every inducement has been held out by the Government for

the construction of wells by private capital; while a recent enactment, applicable to all India, enables any landholder to obtain a loan from the State for this purpose on easy terms as to repayment. Granting that there are a few localities where wells may be usefully employed, it is certainly disheartening at this late hour to find the antiquated idea that well irrigation should generally be encouraged still favoured among the highest officials of the Empire. Years ago Sir Arthur Cotton showed that irrigation from wells twelve to fifteen feet deep was from forty to eighty times more expensive than the process of storing drainage in tanks and reservoirs. Moreover, the tank-stored water, charged with fertilising matter, is immensely superior to well water for cultivation purposes. However, let this also pass, for there is another objection to irrigation from wells, which bears more immediately on the subject in hand. What, it may be asked, is the cultivator to do when his wells dry up? Steam-pumps being beyond his pecuniary resources, his well is of a moderate depth only, and in years of drought even drinking water is a scarcity, owing to the small quantity of drainage that percolates through the soil, and the rapidity with which such rain as previously fell ran off the surface of the denuded country. In 1875, the Madras Government were much exercised regarding the serious way in which the plantations of the Forest Department, situated in the North Arcot district, had suffered from drought. The Madras Conservator of Forests has also remarked, in a recent report, that—

“The extreme drought of the past two years has told much upon the appearance of the ceded districts. “I observed,” he writes, “not a few trees dead and dying from the drought; this has rarely, if ever, come under my observation before, certainly never to such an extent.”

It is worthy of remark that the drought has proved fatal to the Casuarina trees. Some twelve acres were planted at Camalapore with about

12,000 plants intended for fuel for the railway; these had reached a height of forty-five feet and a girth of from nine to twenty inches, and were growing very well till last September, when they began to succumb to the lengthened drought, and about 70 per cent died off. Here, there is actual evidence of the growing dessication of the country, and this can only be due to the fact of previous excessive rainfall having entered the soil in insufficient quantities to support vegetation during the subsequent season of drought. Under such circumstances (if they continue) it will scarcely be a profitable matter, either to the state or to the cultivator, to encourage the construction of wells for cultivation purposes.

For 1874 the actual extent of land cultivated in the Madras Presidency (excluding Zemindary), amounted to 14,236,072 acres of dry and 3,510,615 acres of wet. Nearly 2,000,000 acres of the dry cultivation were under cotton and indigo, while 52,000 acres of the wet cultivation were under sugar-cane. Deducting these, there remain for 1874 the approximate figures of $12\frac{1}{4}$ millions of acres under the dry grains, and $3\frac{1}{2}$ millions of acres under rice, *i.e.* the proportion of land growing inferior grains to that under rice would be about $\frac{3}{4}$ ths of the whole, and not $\frac{4}{5}$ ths as stated from memory in the letter previously mentioned. Still, this lower proportion affords matter for serious reflection, and gives the key to the uniform poverty of the millions who cultivate the plains, which are situated among the granitic and granitoid formations prevailing in South India generally. Mr. Croll tells us, in his work, *Climate and Time*, that—

“The rate at which rivers carry down sediment is evidently not determined by the rate at which the rocks are disintegrated and decomposed, but by the quantity of rain falling and the velocity at which it moves off the face of the country. Every river system possesses a definite amount of carrying power, depending upon the slope of the ground, the quantity of rain falling per annum, the manner in which the rain falls, whether it falls gradually or in

torrents, and a few other circumstances. When it so happens, as it generally does, that the amount of rock disintegrated on the face of the country is greater than the carrying power of the river systems can remove, there a soil necessarily forms. But when the reverse is the case, no soil can form on that country, and it will present nothing but barren rock."

In the above abstract proposition is displayed the root of the evil which attaches to agriculture on the arenaceous soils of Southern India; where the lighter fertilising matters are carried off by the rapidly escaping drainage, and an unseasonable fall of rain, at one time, washes off the slight dressing of manure, that the cultivator can afford to place upon his fields; and at another, sweeps away his growing crops entirely, or covers them with many inches depth of sand. What the country is now urgently in want of is, in short, this: that the soil which has been carried off its surface shall be enabled once more to form, and that the further progress of physical deterioration should be energetically arrested. Then, when the *fons et origo mali* has been annihilated, but certainly not before, we may hope to lead the Hindoo cultivator along that path of agricultural improvement whose effects in our own favoured island produce considerably more per acre than the land of any other civilised country.

To exemplify how strangely the conservative action of woods upon inundations has been neglected by some of the most eminent of Indian engineers, and into what false reasoning this oversight has led them, I will quote one more passage from the report of the late Colonel J. C. Anderson, which I have before made use of in these pages.

"Very exaggerated views," he says, "of the capabilities for sustaining extensive systems of irrigations from the rivers on the eastern coast of this (Madras) Presidency have been entertained by the public, and have been persistently urged on the notice of Government. Even the Commissioners appointed to inquire into the Public Works system in the Madras Presidency would have led the readers of their report to the conclusion that the

superiority of Tanjore over the districts adjacent to Madras was to be ascribed mainly to one cause only, viz., that capital to a vast amount had been invested in it in bringing water to the fields, while they lost sight of the fact that Tanjore has extraordinary natural advantages in possessing a deltaic tract of country traversed by a number of arms of the Cauvery; and that moreover no amount of capital expended in attempting to bring water to the fields in North Arcot or Madras could place these districts on the same footing as Tanjore, unless the source from which that water was to be drawn could, in the first instance, have been made as abundant and as unfailing as the Cauvery."

And so it is very generally held at present that outside the tracts watered from the Cauvery, Kistnah, Godavery, and Tambrapoorney, there is no water available for extending irrigation from the minor rivers of Southern India.

But if we look at actual facts, is it true that there is no available water that could be employed in extending irrigation? Has not sufficient evidence been already adduced in the foregoing pages to show that there is in reality plenty of water running in the rivers whenever rain falls; and that the sole difficulty in the way of utilising it is that it drains so rapidly off the face of the land that it is impossible practically to retain it, with the result that instead of being a blessing to the unfortunate country, all water in excess of what is required for the moment is actually a curse? For instance, if we turn to the reports from the Madras Collectorates for the fortnight ending 13th October, 1877, we find the following remarks for the district of North Arcot:—

"There has been a decided and extremely satisfactory improvement in the season. The rainfall throughout the district has been very copious, and the Palar and other rivers were for the whole fortnight in full fresh. Almost all the river-fed tanks are quite full, and the rain-fed tanks have received good supplies. The cultivation of wet crops under these sources of irrigation is in active progress, and the crops under wells and channels are all in a thriving condition. . . . Agricultural operations are in a remarkably active state. The grant of loans by Government for purchasing seed grain has had a beneficial effect in stimulating agricultural industry on the part of the poorer classes of ryots. The rainfall has been

so very great in the Punganoor Zemindary, that the safety of its tanks has become a matter of considerable anxiety. No less than sixty tanks, including the large one at Sankararoyalpet, yielding an annual revenue of Rs. 10,005, are already reported to have breached. Rain is falling heavily all over the district, and the rain at Chittoor on the night of the 13th inst. amounted to five and a half inches, which fell in about six hours."

This is the state of matters before the north-eastern monsoon has set in ; and yet a very little more rain would have changed the long hoped-for benefaction into a calamity ! Again, from Cuddapah, it is reported, "The weather is all that could be desired for the crops. Most tanks are full." And in the subdivision of this district, "Nothing could be more promising than the agricultural prospects at present. *The chief fear is the breaching of tanks from excessive rain!*" Just, too, as I am despatching this MS. from India the following paragraph appears in the columns of the *Madras Mail* :—"A private telegram from Bellary states that it has been raining there incessantly since last evening. Several tanks have burst. Crops are suffering. Heavy rain is also reported from Guntoor."

Such, then, being the normal condition of affairs whenever a heavy fall of rain takes place, can it be seriously asserted that water for extending irrigation is not usually available ? Then there is the fact that every two or three years the country is visited by a cyclone, during which falls of rain to the amount of as much as $17\frac{1}{2}$ inches in the twenty-four hours have taken place ! While, however, an ordinary heavy fall of rain does great damage to the agriculture of the country under its present physical aspects, it stands to reason that the precipitation due to cyclones can only be regarded in the light of a scourge. But since restorative and conservative measures are urgently required for placing agricultural production beyond the damaging influences of the usual vicissitudes of seasons, how much more is such a policy demanded in order that

we may, as far as lies within our power, ward off the disasters which follow on anomalous falls of rain taking place during tropical hurricanes. It is true that it is impossible to prevent some of the local effects of these deluges. We cannot prevent rain and wind from beating down the crops to the ground, and stripping off the ripening ears of grain ; but we may, to a great extent, prevent floods from washing the crops bodily away, or covering them with sand ; and by making the flow of drainage more equable, we may minimise, in a considerable degree, the damage that is now done to storage tanks and other irrigation works. In these respects, therefore, we may do much to neutralise evils, and may, besides, pluck from the very affliction that smites us the means of reparation and recovery.

Looking inland from the house that I occupy on the shore of the Bay of Bengal, one sees a steep ridge of hills which touch the sea some little way to the north. From there they run along a distance of nearly seven miles, rapidly increasing the space that lies between their slopes and the coast, after which they turn sharply away inland for about seven miles further, where they terminate. Parallel to this second direction of the ridge, and about two miles south of it, running directly inland from the shore, another and similar line of hills forms the opposite side of the valley, its more distant extremity extending two miles beyond the termination of the first ridge. Both ridges have a height of less than 1,000 feet at their highest points ; their formation is of disintegrating gneiss, and they are covered with stunted jungle, which clothes them with verdure during the rainy season, but through whose dried up dusty branches the reddish-brown rock is seen in the hot weather. The southern ridge is entirely bare of timber, and is furrowed by dry ravines ; but in the narrow folds between some of the spurs of the northerly hills, grow

patches of heavy jungle; just below which again are gardens of various kinds of fruit-trees rather thickly planted together. In the water-course lines of these valleys flow streams which never fail, except after several consecutive seasons of excessive drought. Passing round the inland extremity of the northern ridge, and following the back of the slope for a short distance, one arrives at a considerable circular valley or dell shut in by an inclosing spur. The sides of the dell are covered with trees, and within it are situated ancient Hindu temples, which were erected in the thirteenth century. From the foot of the hill the inclosed valley is entered through a massive gateway, after passing which, one finds oneself at the bottom of a broad flight of masonry steps conducting to the different temples which stand among the trees and gardens covering the hill slopes. On each side of the flight of steps runs a never-failing stream of water in a masonry conduit, broken by cascades. These streams, it is needless to add, are held in great veneration, and their flow having never been known to intermit, it is attributed to supernatural causes. Now, there is not the shadow of a doubt that the timber which exists in the few spots described of the northern ridge is the sole cause of the really plentiful water supply that is here available. On the southern ridge, where there is not a single tree, there is also not a drop of water now procurable, in spite of the fact that the season has been a remarkably favourable one, and that more than forty inches of rain have fallen during the year, to the end of October.

The valley that I am speaking of has an area of 220 square miles, and the length of its inclosing watershed line is about 250 miles, of which length one-twentieth, at the very outside, would represent the space occupied by the commencements of the watercourse lines. If, then, in order to prevent the drainage that falls along the watershed-line of the

valley, from flowing rapidly away, it were determined to plant patches of forest, say 200 yards in breadth, in and about the heads of the drainage channels, we should require to plant for the valley under consideration,

$$\frac{250 \times 1760 \times 200}{4840 \times 20} = \frac{4,400,000}{4840} = 910$$

acres nearly. Turning to the report of the Madras Forest Department for the official year, ending 31st March, 1875, we find the cost of plantations (excluding teak) to be about 5*l.* per 1,000 trees, looked after for from three to four years. And allowing 1,000 trees to be planted on each acre, the cost of the proposed plantations for the before specified valley would be 4,550*l.*

Now, since there are about 80,000 square miles in the Madras Presidency which would require to be treated in the same way, the cost to be incurred

would be $\frac{80,000}{220} \times 4550 = 1\frac{3}{4}$ millions

sterling nearly; which can only be considered a ridiculously small expenditure compared with the benefits to be derived. No establishments similar to those of the Forest Department would be required for the scheme under consideration, since this would be more efficiently supervised by the revenue authorities working through the village officers. Neither would expenditure be required for the necessary land, since the whole of the localities would be the waste grounds belonging to the villages in the neighbourhood; which, as well as those at a distance, would reap an ample compensation from the plantations. An additional reason why the proposed scheme should be carried out entirely by the villagers themselves is, that its execution would be one great step towards the urgently called-for reform of teaching the cultivating classes the necessity of personal independence and self-reliance. A quarter of a century of our rule has been most harmful to the people in this respect; as is proved by the fact that the ryots in the

Zemindary put their shoulder to the wheel and help themselves in cases where a Government ryot invariably looks to the officials to assist him. Five and twenty years ago, before the Public Works Department was established, and when the irrigation works of South India were looked after by the revenue authorities, every ryot, in conformity with immemorial custom, was bound to supply the labour for carrying out certain petty and emergent repairs; but with the transfer of the works from the hands of the officers who had the legal power to enforce this custom, the custom itself has fallen into desuetude, with the result of gradually demoralising the agricultural population in all that regards self-help. The execution of the proposed scheme by the revenue authorities would consequently afford a favourable opportunity of re-establishing a system which will really be, under existent circumstances, a far-reaching educational measure for the masses of South India.

It may be useful if in this place a pause be made in order to glance at the actual effects of an Indian cyclone upon the public wealth. I write from a district which was visited in the first week of October, 1876, by a cyclonic storm of a violent character; and though exact figures are not attainable, I shall be able to give my readers a sufficiently accurate notion of the damage which was occasioned by the heavy rainfall, amounting to more than seventeen inches, that was experienced during twenty-four hours. In the first place, the actual loss of human life was about one hundred lives, not to be estimated in money. Then comes the destruction of 1,000 cattle and 13,000 sheep, the value of which may be put at 5,000*l.* The damage done to the crops by wind and rain, besides that due to their subsequently withering away (owing to the bursting of irrigation tanks), as well as the injury done them by sand conveyed by flood-water, was estimated at 150,000*l.* To the above must be added 10,000*l.* for

damage done to roads and bridges, 30,000*l.* required for the repairs of tanks, channels, and irrigation weirs; and 20,000*l.* required for rebuilding of houses; making a total of 215,000*l.* for losses occasioned by the storm spoken of. The affected area measured about 2,500 square miles, and the cost of planting this tract of country after the manner already described would amount to about 52,000*l.* Had the plantations existed at the time of the cyclone, it is true enough that they could not have prevented *all* the loss that actually occurred. But, it may be reasonably asserted that they would, in all probability, have saved a quarter of the whole damage that was done, by restraining the flood of drainage from covering the country; so that the cost of planting the 2,500 square miles in question would have been paid for by the protection which would have been afforded in a single cyclone. But, even were the saving much less than I have supposed, the expenditure would have been well worth incurring, putting out of consideration the more permanent benefits which such plantations would confer on this tract of country in ordinary years.

These plantations, by increasing the quantity of water percolating through the soil, would add enormously to the now scanty vegetation that is available as pasturage. Being specially designed for the conservation and restoration of the moisture of the country, they must necessarily be exempted from being drawn on by the people for fuel, or from being used by them as grazing ground for cattle, sheep, or goats. This latter point, I venture to assert, is a capital one, and to the reckless way in which it has been neglected in the past may be attributed the extensive harm that has been done to the natural drainage of Southern India. In spite of the daily and largely increasing demand for fuel, during the past twenty-five years more especially, the jungles and forests bordering the watercourses would

not have undergone such utter extinction as they actually have had it not been for the ravages committed by the sheep and goats. The subject has, one may say, never been brought into prominence until very recent years; but now, when the labours of naturalists and physical geographers have shown how nice and exact is the balance, through all nature, between the *fauna* and the *flora* of a country, and how disastrous the effect upon the one may be from a disproportionate activity of the other, there is no further excuse for shutting our eyes to the necessity of remedying the grave evil which has already been occasioned on this head in South India.

The Government report for the year ending 31st March, 1876, states the number of cattle and sheep in the Madras Presidency to be $8\frac{1}{2}$ and $6\frac{1}{2}$ millions, respectively. Besides these, the number of goats would (arguing from known numbers on smaller areas) probably be $13\frac{1}{2}$ millions; though no official figures are available for the last-named animals. The waste lands used as pasturage for these amount to five millions of acres only; so that on each acre we have,

1·65 Cattle,
1·35 Sheep, and
2·7 Goats;

a number of beasts so manifestly in excess of what the present scanty pasturage can support, that the reason is plain why the young forest-trees of the country have no chance of existence; and why the watercourses upon whose banks their stunted skeletons grow are mere dry ravines filled up with stones and sand.

Mr. Wallace, in his work, *The Geographical Distribution of Animals*, mentions how "the introduction of goats into St. Helena utterly destroyed a whole *flora* of forest trees, and with them all the insects, *mollusca*, and perhaps, birds, directly or indirectly dependent upon them." And

though, of course, the limited area of that island and the unlimited powers of reproduction inherent in goats made the catastrophe which supervened in St. Helena more evident and decisive, there cannot be the slightest doubt that the very same process of destruction is going on over the enormous territory of South India, and is fully appreciable by those who make physiography their study, or have, like myself, had the opportunity of observing wide deserts, such as those of Central Asia, where natural restorative processes are dominated and rendered of no avail by the destructiveness of the flocks and herds of the nomadic tribes. It was in the Kizzilkoom desert that I first appreciated the enormous force of these scourges. Once, as evening fell, I met a flock of goats advancing across the wilderness in a compact parallelogram, one of whose points was occupied by the leading animal. The dimensions of this moving mass I judged to be about 150 yards long by 100 broad, and its area would, therefore, have been 7,500 square yards, and allowing two animals per square yard, there were 15,000 goats in the flock! During the whole of the day these animals had been scouring the adjacent country for miles in search of food, and every young shoot of vegetation they found must have been destroyed! Under such circumstances, is it any wonder that no water is to be met with, and that nature presents such unchangeable and persistently repellent aspects for mankind in regions where the youth of our race was passed?

La Bruyère said that most men spend one-half of their lives in making the other half miserable; an apothegm whose truth few of us, generally speaking, have not had some opportunities of realising. Nor is the career of communities less subject than that of the individuals composing them to evils consequent upon ignorance or disregard of the laws which govern the economy of the universe. Hence the

importance of the labours of the statesman, the man of science, and the philanthropist, who desire to palliate or to put a period to calamities induced by human action, in spite of the bitter experiences of bygone empires and populations.

Of labours of this sort the present century is prolific enough, more especially in reference to India. Whether, however, the results which follow sufficiently indemnify them is perhaps a question worthy of consideration. Does it, for example, become a nation which prides itself on its practical qualities to be wasting time in finding out when drought may exactly be expected rather than to set to work energetically in order to prevent the occurrence of any drought whatever? Photograph the sun as much as you please, and keep ever so sharp a look out as you will on the number of his spots, what practical good will these investigations do you? While floods and famines alternately devastate the land with unerring certainty and increasing intensity, where, I would ask, is the difficulty of seizing the evil that requires to be remedied? Like the philosophers of Laputa, our own are engaged upon a thousand praiseworthy schemes for putting everything on a new and improved footing within our Eastern Empire.

"All the fruits of the earth shall come to maturity at whatever season we think fit to choose, and increase a hundredfold more than they do at present, with innumerable other happy proposals. The only inconvenience is,

that none of these projects are yet brought to perfection; and, in the meantime, the whole country lies miserably waste, the houses in ruins, and the people without food or clothes."

If this be not a true picture of the actual posture of many well-meaning Englishmen towards India, and of the state of this country at the present moment, it is at least one which has very fair chances of being true before long time has elapsed.

And here my task is ended. Of the want of communications in Southern India I have said nothing, because this subject has been so exhaustively treated by Sir Arthur Cotton. What he prophesied on this head a quarter of a century ago came true in the Orissa famine, and has again proved true in the present Madras famine. On the one hand, thousands of bags of rice now lie rotting on the Madras beach which the railway is unable to carry to districts crying out for food. On the other hand, millions of quarters of wheat are unsaleable on the banks of the Upper Mahanuddy and its affluents, while the population of England, according to the *Times*, will probably pay what amounts to twenty millions sterling additional for their next year's bread. But these are questions altogether beyond the scope of my present design, which is to ask attention to one of the most crying evils—and in my own opinion the most crying of the evils—now afflicting Southern India, *i.e.*, the increasing desiccation of the country from the reckless destruction of its trees and forests.